THE AMERICAN GAS LIGHT JOURNAL

INC.

PUBLISHED WEEKLY, AT No. 42 PINE STREET.

VOLUME CI., No. 12.
Whole No. 2,050.

NEW YORK, MONDAY, SEPTEMBER 21, 1914.

Subscription, $3 Per Year.
$4 Canada, $5 Foreign.

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The Electrical Separation of Tar from Coal Gas.

[Prepared for 23d Meeting, Michigan Gas Association, by ALFRED H. WHITE, R. B. ROWLEY[1] and C. K. WIRTH.[1]

Two years ago there was presented before the Michigan Gas Association a preliminary paper on the Electrical Separation of Tar from Coal Gas which showed that it was possible to free gas almost absolutely from tar and other suspended particles by means of a direct-current high tension electrical discharge in accordance with the general principles followed by Cottrell and others for the precipitation of smelter fumes. Although the earlier paper showed the possibility of using this process it also stated that the problem was far from being solved. Work has been continued on this problem until it has now reached a stage where it is ready to be tried on a larger scale than is possible with resources at our command. We, therefore, present here a statement of the development of the process and its status, and also a discussion of the advantages which might accrue from its introduction on the large scale.

1. Holders of Michigan Gas Association Fellowships in Gas Engineering at the University of Michigan.

The fact has long been known that solids and liquids suspended in gases will be precipitated by a suitable electrical discharge. The first attempt at a practical use of this knowledge was made in 1884, by Walker, acting apparently on a suggestion from Sir Oliver Lodge. His patent described it as a "process for separating and collecting particles of metals or metallic compounds, applicable for condensing fumes from smelting furnaces and for other purpose." The attempted use was to precipitate lead fumes. A Wimshurst electrostatic machine was the source of power, and the process seems to have failed on account of the unreliability of the machine. The more recent development of electrical precipation was stated by F. G. Cottrell and his associates. His patent, taken out in 1908, calls for the following conditions for successful operation: (1) A direct current discharge should be used or, at least, there should be a long time required for reversal of direction in comparison with the time taken for deposition of the individual suspended particles; (2) the particles should be charged at or near the electrode about which the brush discharge appears (the "active" electrode); (3) the particles should be deposited on a surface on which there is practically no brush or wind discharge (earthed electrode); (4) the suspended particles should be subjected to as uniform treatment as possible. The high voltage, direct current was obtained by transforming the current of ordinary line voltage to the voltage desired and then rectifying by a synchronously-driven, rotating commutator. The active electrode was given a good discharge surface by the use of strips of mica or cloth. Such an electrode was called pubescent. Heat and a current of clean gas were proposed to maintain its insulation. Work on the above lines has been successful in the precipitation of fumes in many cases. Prof. W. W. Strong, of the University of Pittsburgh, conducted some tests in 1912–13 on an experimental scale. The results obtained, which are pertinent to this paper, are as follows: (1) Since the negative corona is much more uniformly distributed about the active electrode, and since it possesses greater stability as regards sparking, the negative corona discharge is much more suitable than the positive for electrical precipitation; (2) under similar conditions of the electrical circuit, the loss due to the positive corona is slightly greater than that due to the negative corona at the same voltage; (3) increasing the air velocity raises the negative sparking potential but does not effect the positive; (4) as larger negative currents can be obtained, the negative corona is better adapted for electrical precipitation than the positive; (5) the presence of suspended matter in the gases does not affect the corona currents greatly; (6) the presence of suspended matter in hot gases increases the sparking potential and, in ordinary air, lowers it.

The electrical apparatus which we used in our work was purchased from a dealer in physicians' supplies and formed part of a set intended for X-ray work. The transformer had a capacity of 5 amperes on the 110 volt circuit, with its primary wiudings brought out at various points so that it was possible to obtain voltages on a secondary side, varying from 10,000 to 40,000. It was operated with a variable resistance in series to allow closer regulation of the voltage. This high tension alternating current was rectified by a commutator driven by a cynchronous motor. The whole apparatus is compact and has operated in a very satisfactory manner.

The chief difficulty in adapting this process to gas manufacture lay in the design of electrodes. The necessity of having all joints gas tight and the danger of fire in case of a leak made the problem more difficult than if smoke or smelter fumes were being treated. The effect of tar and of water had also to be studied. The precipitating

unit, which seemed most advisable, was made from a standard 6-inch or 8-inch gas pipe down whose center ran the carefully insulated active electrode. A fair test of the effectiveness of an electrode seemed to be obtained by visual observation in a dummy tube in a darkened room. A sheet-iron pipe, with holes cut in its sides at intervals, was placed in a vertical frame and electrically grounded. The electrode to be tested was suspended in this. On applying current at gradually increasing voltage to the electrodes, no vissible effect was observed, nor did the milleameter indicate any current until the difference of potential between the electrode and the grounded pipe had risen to 6,000—10,000 volts, varying with the type of electrode. The first visable effect appeared as bright spots at points on the wires where they had been kinked or accidently roughened. Their appearance changed with increasing voltage, according to the sign of the current. If direct current was used and the wires were positively charged, with increased voltage the glowing points became more numerous and brighter and finally resolved themselves into distinct cones of violet rays, with their apices on the wires and their bases on the pipe. As the limiting voltage was approached the whole wire vibrated rapidly and was surrounded by a violent haze while the pipe seemed filled with the radial discharge. As the limiting voltage was reached, sparks commenced to jump across the gap and the voltmeter and ammeter, which previously had been steady, swung with every spark. If the voltage was still further raised, a high tension arc was formed with a sudden and large increase in the current. If the central electrode was charged negatively and the voltage increased as before, the bright spots on the central electrode became brighter and more frequent, but there was no appearance of the discharge rays which were so marked when the wires formed the positive pole. It was possible to carry a somewhat higher voltage when the central electrode was negative and a slight eccentricity in its position did not so readily cause a disruptive discharge. If an alternating current was used both the brush and the point effects were plainly seen, sometimes on the same wires. If the central electrode was hung at all eccentrically the brush discharge appeared on the parts nearest to the earthed electrode.

It was not possible to determine the visual nature of the discharge when the electrode was in actual operation on crude gas, but a comparison of the voltmeter and ammetor readings, with the apparatus in actual operation and in the observation pipes, indicated that no effective precipitation was obtained unless the wires were giving a visually active discharge. The positive discharge was somewhat more effctive than tbe negative, but the negative was generally used in our tests because there was less liability of a disruptive discharge. The alternating current showed itself almost ineffective in causing precipitation. Whatever may have been the effect of the electrical discharge upon the individual tar particles it did not drive them against the wall of the pipe, so that the amount of tar in suspension at the outlet of the precepitator remained substantially as great as at the inlet.

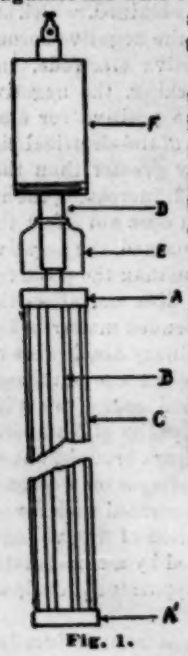


Fig. 1.

The type of electrode finally adopted as best suited to the work consisted of a cylindrical series of fine iron wires mounted on the circumference of cast iron disks placed at intervals along a piece of gas pipe passing through an insulator in the top of the precipitating chamber. The general scheme of the electrode is shown in Fig. 1.

The wires first used were twisted picture wires having a total size of approximately No. 10 and individual strands of No. 25. No visible discharge could be obtained with these wires until a disruptive discharge occurred. Single strands of No. 20 soft iron wire gave only a feeble discharge both for the positive and negative directions at a potential of 24,000 volts. Single strands of No. 31 wire gave an excellent discharge but lacked the necessary mechanical strength for practical operation. The wire found to give the best results considering both quality of discharge and mechanical strength was a tempered steel music wire with diameter of 0.013 inch equivalent to No. 27 or 28.

The effect of the distance between the active and earthed electrode was nesessarily observed in connection with the various experiments. The size of the earthed electrode was varied from 6 to 8 inches in diameter. The active electrodes were made 2, 3 and 4 inches in diameter. The best results in the 6-inch pipes were obtained with a 3-inch electrode strung with twelve No. 27 wires. The electrode was 4 feet 6 inches long and the wires were supported in the middle by a 3 inch wooden disk fastened about the ¼-inch gas pipe. This disk served two purposes; (a) in all cases it prevented the wires from whipping, which leads to a disruptive discharge; (b) in actual precipitation it kept the gas from traveling up inside the wire cylinder out of the active electrical field. In the 8-inch pipe the best results were obtained with a 4-inch electrode strung with sixteen No. 27 wires. This electrode was 5 feet 8 inches long and the wires were supported, in addition to the iron plates at the ends, by two wooden disks equally spaced. The limiting voltages in air for the above e lectrodes were:

Diameter of Active Electrode.	Diameter of Grounded Pipe.	Voltage.
3 inch.	6 inch.	14,000
4 "	8 "	24,000

These voltages varied with the humidity of the air at the time of the experiments. If a great deal of care was taken and the electrode exactly centered in the pipe, the disruptive voltage for the positive and negative discharge was the same. If the electrode was a little eccentric the disruptive discharge occurred at a much lower voltage with the wires positive than it did with the wires negative. These electrodes were made to hang rigidly in the precipitating chamber by fastening them into suitable insulators which were in turn cemented into threaded nipples. The whole electrode was kept of smaller diameter than the nipple, so that the whole unit could be lifted out. Tubes of Bakelite possess certain advantages over porcelain as insulators. They are tougher and may readily be machined. If, however, through formation of a tar film the current commences to creep across the insulator, the Bakelite chars and forms a carbon path so that the insulation soon breaks down completely. On the other hand, when creeping starts across a tar film on a porcelain insulator the local heating of the porcelain causes the tar to distill, so that the insulator frequently clears itself. Such a temporary breakdown due to tar films is at once indicated by a large increase in the current and a decided drop in voltage on the high tension circuit. The efficiency of the precipitator is then greatly lessened on account of the lower voltage until the electrode clears itself again.

Part of the tests on tar precipitation under various conditions were made at the Michigan Gas Association's Experiment Station at the plant of the Ann Arbor Gas Company. In this station the gas from one of the regular retorts is led through a water jacketed condenser through which hot or cold water may be made to circulate so that the temperature may be readily controlled. Following the condenser comes the tar separator, a Scirocco blower acting as an exhauster, an ammonia washer, purifying box and station meter. The ammonia washer consists of a short tower filled with wooden girds, over which water is distributed by a rotating spray, and the purifying box is of the usual type containing trays filled with iron oxide. The tar separator adopted for this work consisted of a felt-jacketed 6-inch gas pipe 6 feet long set vertically. The gas entered at the center of the bottom through a 2-inch pipe and left at one side near the top. The electrode was cemented into a 3-inch nipple which screwed into the flange at the top of the precipitator. The electrode was of the squirrel-cage type and consisted of a ¼-inch gas pipe 4 feet 6 inches long, carrying at each end a 3 inch iron disk with six No. 25 piano wires stretched between them. A sketch of this electrode is given in Fig. 1. The maximum flow of gas from the single retort attached to this apparatus was 11.2 cubic feet per minute. This gave the suspended particles 4.7 seconds in the electrical field. Under these circumstances a current of 1.2 milleamperes at 10,000 volts was amply sufficient to remove all of the tar which had not separated in the condenser. As will be shown later, the apparatus is competent to work at many times the speed used in these tests.

The completeness of tar removal was judged by filtering 1 cubic foot of gas from the outlet of the separator through a filter paper placed in a suitable clamp so that the gas was filtered through a disk of paper 2½ inches in diameter. The color of the filter paper gave a good indication of the amount of tar remaining in the gas. The filter paper does not always remain white, even though all the tar has been removed. Particularly when the tar is being precipitated at temperatures distinctly above room temperature, such as 150° F., so that there is considerable drop in temperature in the sampling tube, the filter paper is frequently wet when removed. In such cases it often turns pink or blue on exposure to the air, due probably to sulphide or sulphocyanide compounds. Fig. 2 shows the appearance of filter papers obtained from gas before and after passing the electrical separator.

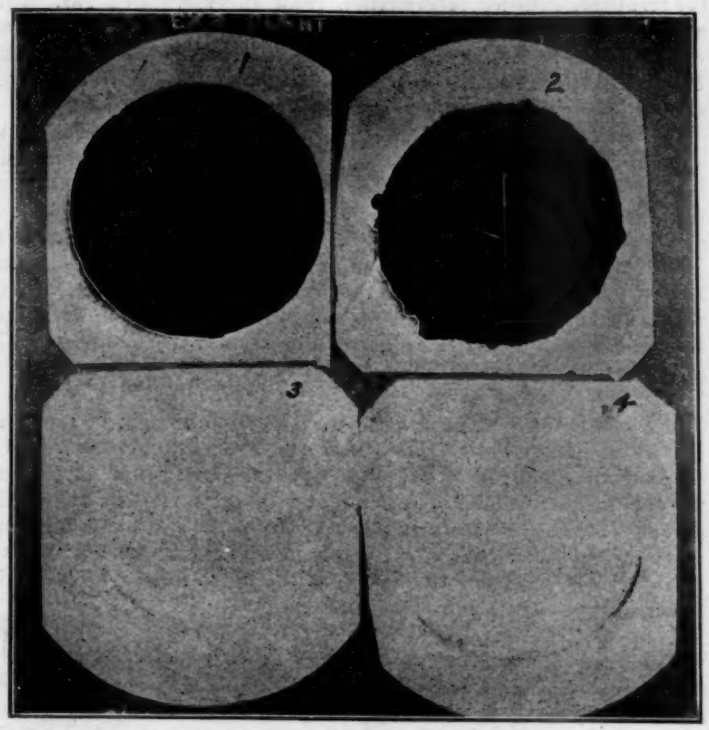


Fig. 2.

The filter papers often showed a deposite of pure white crystallized naphthalene. The whiteness of the naphthalene is itself proof of the completeness of the tar removal. This naphthalene was undoubtedly present as vapor of naphthalene in the electric precipitator and was not precipitable. It condensed and formed crystals in the pipe leading to the filter paper. Sometimes the whole filter paper was covered with a mat of these crystals to a thickness of ¼ inch.

The amount of naphthalene remaining in the gas was quantitatively estimated in several tests and all of the tests agreed in showing that the gas was never completely saturated with naphthalene at the temperature of tar removal. Under the conditions of our tests the gas was usually one-third to one half saturated. Towards the end of the carbonizing period when the gas was being subjected to more drastic conditions of destructive distillation, there was relatively more naphthaline in the gas. At the beginning of the carbonizing period the contrary condition prevailed. In the usual works practice where gas from retorts in all stages is mixed together the extremes found in our study of a single retort would disappear.

These results confirm the investigations presented to your Association in previous years that the tar is usually competent to remove as much naphthaline as is necessary if it is given the proper opportunity. If the tar is removed at a high temperature or without sufficient time of contact with gas, naphthalene may condense in free form further on in the system. The modern tendency is towards rapid condensation and the installation of special devices to take care of the precipitated naphthaline. An electrical separator installed at the coldest point in the system will remove whatever crystalline naphthalene there may be.

After the process had been worked out satisfactorily in the Experiment Station it was transferred to the plant of the Ann Arbor Gas Co. Our thanks are especially due to Mr. H. W. Douglass, manager of the Ann Arbor Gas Co., and Mr. F. Hochrein, its superintendent, for their co-operation and active assistance. It was, of course, necessary that there should be no interference with the regular operation of the plant and there was very little money at our disposal. The only available place for the introduction of the electric precipitator in their system was immediately after the P. & A. tar separator. It was recognized that it was a large step to take the apparatus intended for the Experiment Station with a flow of gas of 5 0 cubic feet an hour and attempt to make it purify at fifty times that rate. There was no opportunity to make an intermediate step, however, and so an attempt was made to purify all the gas made by the Ann Arbor Gas Co.

The installation is shown diagrammatically in Fig. 4. It consisted of an inverted U built of standard 8-inch pipe and tees. The electrodes were cemented into 4-inch nipples which screwed into the top caps of the tees. The electrode found to be most satisfactory was 4

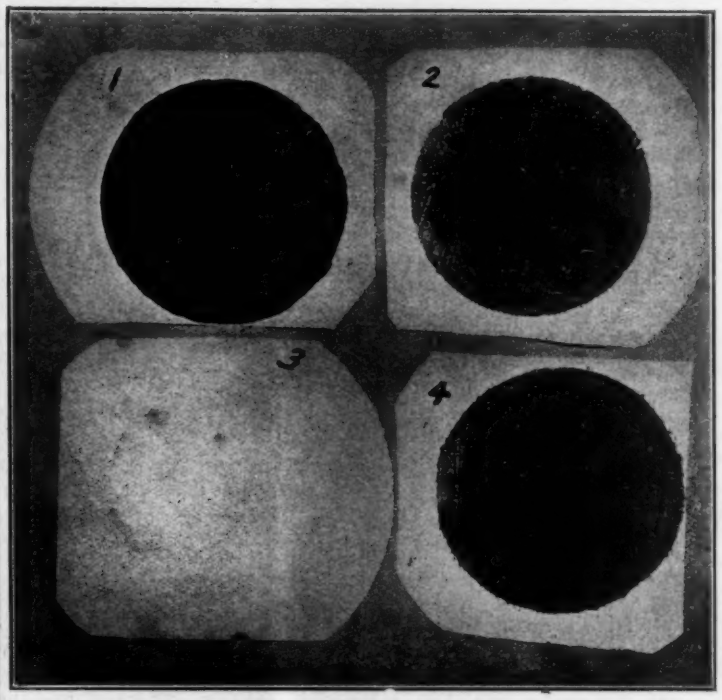


Fig 3.

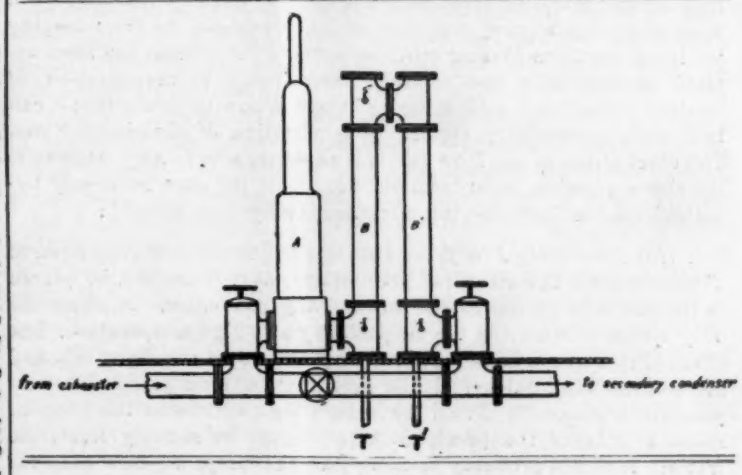


Fig. 4.

inches in diameter and was strung with 16 No. 27 steel wires. It was not possible on account of ceiling height to design the apparatus for electrodes with an effective length of more than 5 feet 8 inches each so that the total length of treating distance was 11 feet 4 inches. The gas made averaged 24,000 cubic feet per hour measured under standard conditions and about 28,000 cubic feet per hour at the temperature of our tests. If no deduction is made for the obstruction caused by the central disks the linear velocity of the gas through this apparatus was 22.6 feet per second and the time during which the gas was exposed to the electric discharge was 0.50 second. If it is assumed that the gas within the 4-inch electrode is dead, then the linear velocity becomes 30.2 feet per second and the time of exposure to the electric discharge 0.38 second. The latter assumption is probably more nearly correct.

This installation was smaller in every way than was desirable, but still did effective work. The negative discharge was usually employed because it was less liable to become disruptive if the electrode swayed somewhat or was not accurately centered. The difference of potential between the wires and the grounded pipe was kept at 20,000 volts as shown by the electrostatic voltmeter. With this voltage the milleameter on the high tension side showed a current of 2.6 to 3.0 milleamperes. The wattmeter on the input side of the transformer varied in its readings from 200 to 230 watts. Very satisfactory removal of the tar could be obtained under these conditions, as is shown in Fig. 3, where filter paper No. 1 shows the appearance of a filter paper taken at the inlet to the electrical precipitator, No. 2 a filter paper taken at the top of the first leg, and No. 3 a filter paper at the outlet of the electrical precipitator. Filter paper No. 4 is added to show the efficiency of the electrical precipitator as a tar re-

mover as compared with the washers of the Ann Arbor Gas Co. It was taken at the outlet of the rotary ammonia scrubber after the gas had passed the secondary condenser, the tar washer and ammonia scrubber. The brown stain on this filter paper shows that tar was passing all of these washers and getting into the iron oxide purifiers.

Although this apparatus thus demonstrates its ability to remove the tar, it could not in its cramped quarters be developed into a commercially successful unit. The voltage limitations imposed by the apparatus made it necessary to use such fine wires on the precipitator that it was difficult to get the electrodes in and out of the pipes without injury to the wires. The limitation on length imposed by the ceiling height, made it necessary to make the insulators shorter than desirable so that they were effective only when strictly clean. They were, however, surrounded constantly by the half-purified gases, and after a few hours became coated with a tar film which allowed leakage of the electric current and usually made it necessary to shut down after a run of about 5 hours. There should be no difficulty with more freedom in design in making an entirely satisfactory plant for continuous operation. The total cost of the electrical apparatus for purifying gas at the rate of 24,000 cubic feet per hour, was less than $300, and the cost of the changes in piping and the precipitators was less than $100.

Our experiments have shown that it is possible to free gas completely from suspended tar particles at all temperatures up to 150° F. There is no reason to believe that the process will not always be successful at higher temperatures. The electrical power required to purify 25,000 cubic feet of gas per hour is less than 250 watts, and the actual expense of the installation used by us was less than $500. The difficulties which hampered us at the close of our experimental work were due to inadequate facilities which prevented us from keeping tar-laden gas from fouling our insulators. The process has heen applied commercially and entirely successfully to precipitation of smelter fumes and acid mists and there is now no doubt that it can be equally successfully applied to purification of illuminating gas. The chief question is. How far is it advantageous? Any answer to the above question must from the nature of the case be largely hypothetical, but the following advantages may be suggested:

1. *Gas Absolutely Free from Tar May be Obtained at Any Desired Temperature.*—The electrical precipitator may, if desired, be placed in the gas before it has passed through any condenser. It offers the only means of removing the tar perfectly at a high temperature. The effect of this would be to leave in the gas more of the light oils and more of the naphthalene. If the precipitation took place at a temperature of about 175° F. all the water would still be in the form of steam and hence the precipitated tar would be entirely free from water. It would probably be more like the prepared tars used for pavements than like the ordinary tar. The gas thus freed from tar could be cooled either in a surface condenser or a washer cooler. The greatest objection to the washer cooler has been the difficulty in subsequently removing the fine tar fog resulting from the rapid condensation of the gas. If the tar were already removed at the higher temperature the washer cooler would only condense some napthalene and possibly a little light oil. Our experience shows that this napthalene separates in a white granular form which washes out of the cooler readily and which may have a commercial value. Any particles remaining suspended in the gas after the final cooling may be readily removed by a second electrical precipitation.

2. *Higher Candle Power and Heating Value May be Obtained.*—Tar cooled in contact with the gas absorbs a certain amount of illuminants from it. If the tar is removed while hot the gas will have a higher candle power and somewhat higher heating value.

3. *Oil Washers Will Not be Necessary.*—All tar fog can be removed by an electrical separator. If the gas at the final stage of the purifying process still carries so much napthalene in the vapor form that there may be danger of stoppages in mains and services in cold weather a small amount of light oil may be sprayed into the gas prior to a final electric separator. The fine drops will dissolve the excess of napthalene and will themselves be removed by the electrical precipitator. The quantity of the light oil may be instantly changed to suit varying conditions and its quality may be adjusted to enrich the gas if desired.

4. *Cleaner Ammonia Liquor Will be Obtained.*—Ammonia scrubbers will no longer become choked by tarry naphthalene mixed often with mineral matter precipitate from hard water. Mineral matter from the water will be precipitated as powdery calcium carbonate. Naphthalene can only separate on account of drop in temperature in the scrubber, causing precipitation from supersaturated gas. This will be an unusual condition but any naphthalene thus separating will be in the form of white crystals which will readily wash out. The resulting ammonia liquor will be clean and of uniformly high strength since the scrubber will always be operating efficiently.

5. *Direct Sulphate Will be Possible.*—The direct production of white ammonium sulphate offers no theoretical difficulties provided the gas is entirely free from tar. If either the hot or cold gas is made to pass up a lead lined tower down which dilute sulphuric acid trickles a dilute solution of ammonium sulphate will result. If this solution is circulated with constant addition of a small amount of concentrated acid, the solution coming down the tower will always consist of dilute acid with a constantly increasing amount of ammonium sulphate. In time this will become a saturated solution and any additional sulphate formed will crystallize in the tower and separate in the cistern below.

6. *Purification Will be Easier.*—In the present system of purification by iron oxide the purifier acts as a mechanical filter to remove suspended tar fog. It performs this function, however, at the expense of its normal one. Oil or tar films on the surface of the oxide prevent proper contact of the hydrogen sulphide and oxide and cut down the capacity of the box. With clean gas the efficiency of the operation will be higher and the life of the oxide longer. Wet purification also becomes more practicable.

7. *Incidental Advantages.*—The black smoke emitted by the gas works when retorts are being charged and when producers are being fired or poked sometimes causes serious complaint. The problem of smoke precipiiation by electrical means has been completely solved by the Research Corporation and the same type of electrical equipment will answer both for gas purification and for smoke abatement.

Conclusion.

The experiments here reported have demonstrated that gas may be completely freed from suspended tar particles with an expenditure of about 0.2 K. W. hours per 25,000 cubic feet of gas purified per hour. The cost of installation is small and almost no attendance is required. It does not seem that there will be any serious difficulty in putting the process into successful commercial operation, and the advantages in the way of better and purer gas make it extremely desirable that it be tested on a really large scale. We have carried the work as far as is possibte with our facilities, and hope that it will be taken up by others equipped to study its continuous operation with large units.

Titles of Plates.

Fig. 1. *Diagram of Electrode.*

A. Cast-iron disk threaded from both sides.
B. Gas pipe ¼-inch diameter screwed into A and A'.
C. Fine discharge wires connecting A and A' and forming the active electrode.
D. Lower terminal of insulator.
E. Glass Insulating Sleeve.
F. Iron pipe into whose upper part insulator D is cemented.

Fig. 2. *Photographs of Filter Papers from Gas Experiment Station.*

One cubic foot of gas was filtered through each paper.
Rate of flow of gas through precipitator, 500 cubic feet per hour.
Time of exposure of gas to electric field, 4.7 seconds.
1. After frictional tar separator with perforated plates.
2. Before frictional separator.
3. After electrical separator Frictional separator by-passed. Positive discharge.
4. Same as No. 3, but negative discharge.

Fig. 3. *Photographs of Filter Papers Showing Operation of Electrical Precipitator at Plant of Ann Arbor Gas Company.*

One cubic foot of gas filtered through each paper.
Rate of flow of gas through precipitator, 24,000 cubic feet per hour. Linear velocity of gas, 30.2 feet per second.
Time of exposure of gas to electrical field, 0.38 second.
1. After the P. and A. separator.
2. After the P. and A. and first half of electrical separator.
3. At outlet of electrical separator.
4. Comparison paper taken at the outlet of the rotary ammonia scrubber of the Ann Arbor Gas Company to show the amount of tar remaining in the gas with their every-day operation.

Fig. 4. *Diagram of Installation of Electrical Precipitator for treating 24,000 cubic feet of Gas per hoar in Plant of Ann Arbor Gas Company.*

A. P. and A. fractional separator.
B. B'. Two 8 inch pipes, each 5 feet long exclusive of tees, used as the precipitating chamber of the electrical separator.
S., S'., S''. Sampling holes.
T., T'. Tar drips.

Building Confidence in Business.

[Address by MR. HARRY N. TOLLES, before the Michigan Gas Association.]

I feel that success in life comes from following nature's laws. There are two kinds of laws, those made by man and laws that are made by a supreme being. Man-made laws change but nature's laws never change. To illustrate what I mean take the law of gravitation, a law of nature. If a man wanted to go from one of your big buildings across the street, and supposing that he knew nothing of the law of gravitation, and decides that he wanted to step out and walk over from the top of one building to the top of the other. You know what would happen. He would take simply one step and they would pick him up with a sponge. Nature's laws are fixed. We know many of them, and I believe that the progress being made in the business world to-day is due to the recognition of the fact that there are governing laws and principles which if we follow we shall succeed; and if we violate those principles we must of necessity fail. Study with me the successful men and institutions of this country, as I have had possibly a rather unusual opportunity to study, and you will find that every man that has made a great success has made that success because he has, consciously or unconsciously, harmonized with nature's laws; and every time that you find a failure the reason for it stands out so plainly that you can usually put your finger on the laws the man violated and which caused his downfall.

I believe that the greatest law that operates in the business world to-day is that of confidence. I like to state that law this way: Every word that a man speaks, every act that he performs, and every thought that he thinks either adds or subtracts confidence in business. Let us illustrate that in the humblest sort of way. You take the meanest employee connected with any of your companies. That employee cannot go home to-night and sit in his little family circle with no one there but the loved ones, and say a knocking or disparaging thing about the management of the business, about his fellow-employees, about the institution, or about the public which patronizes that institution; and go back on the job to-morrow and do as good a day's work as if he had not said that thing. Why? Simply because we are coming to realize that thoughts are things. "As a man thinketh (they used to say "in his heart"—now they don't say "in his heart," because we don't think with our hearts) so is he." Thoughts are expressed in our feelings, and our feelings are shown by our conduct. So, for managers of men, as I recognize you are, one of the most important, most essential features for the successful handling of a bunch of people is to keep them in an attitde of boosting and not knocking.

I have tried before one or two other conventions a little test of the confidence that the public feels when I am speaking, and if it is not too old I would like to try it here. I want to see how much confidence this crowd has in the speaker, and in that way I can determine how long I ought to talk this morning. I will put it this way. Suppose I say to you something which in the light of your own experience you couldn't believe to be true, how many of you would believe it simply because Tolles said it was a truth? I want you to all take part. I want to see the hands of those who would believe that and think it was true contrary to their own convictions and experience simply because I said it was true. (One held up his hand.)

I wouldn't be at all suprised at a vote of this kind down in Missouri where there is so much of the "show me" spirit, but I really ought to get a better vote here. Let me come a little closer with a tangible experience. Suppose I say to you that I have in my pocket that which I have never seen, you have never seen and no one has ever seen, and yet I have it in my pocket. Let us see the hands of those who would believe that? (Several held up their hands.)

I see more of them. Don't tell, those of you who know, because I want to get this off on at least one here this morning. Suppose I say that I can take out of my pocket that which I have never seen, you have never seen and no one has ever seen; and I am going to actually show you something that nobody has ever seen. How many could believe that? Suppose I say that that which I take out of my pocket that I have never seen, you have never seen, and no one has ever seen, and that I am going to show to you, will then disappear. I will never see it again, you will never see it again and no one will ever see that thing again. Let us see the hands. (Several held up their hands.)

Again the Old Guard stands by, but there are not quite so many. I do hold in my hand something I am going to show to you and which I have never seen. Let me say this to you: I am not going to believe any more in your company and your proposition than I believe in the man that puts your proposition up to me. Every word that he speaks, every act (and I honestly believe every thought that he thinks in my presence), when he comes to explain his proposition, determines the degree of confidence that I am going to have in him; and all that he says is judged in the last analysis by the weakest thing in his statement. Now then if I fail to make good on this little text you haven't any right to believe any other thing that I say. If, on the other hand I can prove what I have said, I have gone one step further in the gaining of your confidence, which I most earnestly seek. Now, the proposition is, that I hold in my hand something that I have never seen, no one has ever seen, and I am going to show it to you right now. Here is the kernel of the peanut that sees the light of day for the first time. Did you ever see that before? No one has ever seen it before. That which I show you is about to disappear. I will never see it again, you will never see it again, no one will ever see that kernal of that peanut again. (Eats it.)

So, I state again, confidence is the basis of business. We are judged by our weak statements, and not by our strong ones. No man, in the presence of another whom he seeks to influence in business, should say something that the customer does not believe without he demonstrates and proves it then and there, before that prospective customer gets away from him. The things that he says should be within the range of the experience of the other fellow. In other words, if you speak French and I speak German, and I am not able to speak French and you are not able to understand German, there is very little hope of our getting together on a mental proposition. So the importance of using the vernacular, and the man managing men—for instance, gangs of laborers—the man that can best handle them is the fellow who can get on their level and use expressions with which they are familiar.

There are a great many other rules which operate, but I want to work out this law of confidence before you on the white board, showing the various things which do operate in the building of a successful business enterprise. As a basis for our work I draw three concentric circles. The outer circle I am going to call business Building. You gentlemen are in business to build a business, and there are just two essential things in the building of your business. Business building is the power to make permanent and profitable business. In other words, permanency and profitableness are essential. We are living in the age of cost accounting—when we figure things down to the fraction of a cent. Many businesses, many gas projects, have gone shipwrecked because they didn't count the cost and didn't know whether they were making or losing in their individual transactions. There is no use of doing business with a person if every time we do it we lose money. Of course, I don't need to talk to you about the importance of permanency in business. The second circle is Salesmanship. What is salesmanship? There have been many definitions given, but the best definition that I know is the one that centers around this pod of P's. Salesmanship is the power to persuade people to purchase at a profit that which is for sale. Now, I care not whether your product is sold by personal persuasion or comes through monopoly of interest in the community—and I believe that you are entitled to a monopoly, and that it is the only way in which you can operate successfully a gas enterprise. Keep in mind the law which Mr. Wanamaker used to tell us when I was connected with his organization—that law of mutuality that every transaction, to be a good transaction, must be mutually advantageous to all parties concerned. I remember I had a class of insurance men in Philadelphia a number of years ago, and I had said that if we could add a couple more P's to this pod in the definition it would make better "P" soup, and we devised this definition: Salesmanship is the power to persuade plenty of people to pleasureably purchase at a profit.

What I am trying to illustrate is simply that salesmanship is persuasion; salesmanship is an universal principle which applies to every institution, and the institution which says it does not employ salesmanship in its business is not making any profits. In other words, salesmanship has to be applied, either directly or indirectly, and sometimes indirect salesmanship is more potent than direct salesmanship. I maintain that the lawyer who stands before the judge and a jury is a persuader, a salesman; the doctor as he sits beside the bedside of a patient is a persuader, a salesman; the minister of the Gospel, as he stands before his congregation, is a persuader, and I believe that if the ministers in the United States would wake up tomorrow morning with the realization of the fact that they are salesmen, and not merely ministers, that you would find more business

men in the pews. The stenographer, as she sits at the typewriter transcribing her notes, is a sales girl, and is paid for the quality and quantity of goods that she is able to deliver; and she is paid on a commission basis just like every other one is. I think that one of the greatest fallacies in business is for a man to say, "I am paid a salary," because in the last analysis every wage is figured out on a commission basis. I maintain that matrimony is a sales game. I have tried it. I say sometimes that if I had known one-half as much salesmanship during my courtship as I know now that I could have landed my prospect in half the time. Now you catch my thought that salesmanship is persuasion, but there are two kinds of persuasion. There is the persuasive attitude with the law of mutuality; and the other form is coercion, which of all things in this world I detest. In the old days the man that was the stronger physicially was the supreme man. It was the case of "the biggest dog gets the bone." What is the difference whether that dog gets the bone by physical or mental effort. If you are stronger than I mentally, and use your mental powers to coerce me, I maintain that it is just as vicious as to use physical power to get me to do a thing that you want me to do. So keep in mind the thought that salesmanship is persuasion.

Now, the body of your institution is business building; its life blood is salesmanship; but the heart that pumps salesmanship into the body (business building) is service. Yours is a public service institution, and to my mind it typifies the present age. In the past we typify the spirit of the times around the sword. The greatest man was he who could wield that sword, that could get up the largest army and force the most people to bow at his knee. He was supreme, and the pity of it is that it seems as though the pendulum of time has swung back to that old period, when the nations are at war seeking to settle their differences by that sword method. Then came the second period, the period of the pen, from which the expression, "the pen is mightier than the sword." Then the man who could write things that could make the most people bow to him intellectually was the king. We are living in an age which we can typify as the spirit around the plow share. The man that can render the greatest service to-day is the greatest man; and what a splendid thing it would be if those nations now at war could look at each other from the attitude, "How can I render the greatest service, or how can I help you most?" instead of "How can I make you bow before me?" I think that is the trouble in the labor world, and while I am not here to discuss that, and while there are noble exceptions, yet I know there are masses of employees to-day that are standing and shaking their fists in the employers face and saying, "I am going to make you pay me all I can and I am going to do just as little as I can for it." And while there are also splendid exceptions on the other side, some capital stands and shakes its fist and says, "I am going to make you do all that I can make you do, and I am going to pay you as little as I can for it." I honestly believe that the difficulty between so-called capital and labor to-day is never going to be solved until they come to realize that no man is independent, that no man is dependent, but in business to-day we are all of us interdependent, even capital and labor; until they seek to do as much as they can, knowing that Emerson's law of compensation will bring to every man in time his own. Then we will see the millenium in business conditions between the employer and the employee.

I like to illustrate the service idea this way. Let A, B, be a permanent line and A, C, a variable one. Let this represent the individual, or it can represent the institution because the success of any institution is simply the total of the successes of all the individuals in the institution. If everyone in your institution from porter to president is making good in a big way, then your institution is making good. But if there is a failure anywhere along the line just that much is subtracted from the success of every other one in the institution. Let this represent the service rendered, and this the profit. (Drawing 3 cross lines.) How many times have I heard young men in business, say, "I am doing all that I am being paid for and I am not going to do any more. When the boss raises my pay I will show how I can earn more money, but I am paid for so many hours work and then I am going to stop. I am paid to turn out certain reports and to do certain things, and I am going to stop. When he pays me more I will do more." That man condemns himself. Suppose this individual increases his making power just that much. It is going to drive A, C, off like this, the service increases and the pay is increased. Suppose this individual is a little two-by-four fellow. The service is lowered and the pay is lowered, and there will come a time when there will be no service rendered and then these two lines will be parallel. There is no profit and there is no individual. If it represents an individual he is looking for a job some place else; if it is an institution it is airing its troubles in the bankruptcy court. Service is the universal spirit of the times and is the heart that pumps this life blood of salesmanship into the body of business building.

Now I want to direct your attention to some of the things outside of the institution which bring people to do business with it. Take advertising. Applying the law of confidence, I maintain the test of a good advertisement is whether it gets or destroys confidence. Think of the best advertisement you ever saw or that you ever prepared, test it by confidence, and you will find that it is a confidence-getting statement. Some of the biggest salaries paid to day are paid to advertising men. Many advertisements costs more per word than a telegram or cablegram, but did you ever stop to think how easily we rattle off some of the stuff that we put into copy? When we write a telegram we turn around and we look at it from the viewpoint of the receiver and see what impressions he gets. But when we write copy we write from our viewpoint and many times let it go at that. In the "Salt Lake Tribune," one morning sometime ago, I saw a large display advertisement that said at the top, "The greatest of all drug sales." Is that a confidence getting statement or isn't it! How did this fellow know it was the greatest drug sale? Did he know all of the drug sales that have ever been held? The second statement was, "Lease gone, goods must go." A good statement. Then the third line in big type was, "$65,000 worth of merchandise at 50 per cent. or less." I went down the list to find out what was so wonderful about his sale and I saw in a little square, the biggest thing on the page, a 50 cent patent medicine for sale at 29 cents. I went on down the list and there was not a single item advertised for less than 50 per cent., and there was only two items on the page that were as low as 50 per cent. You wouldn't patronize that store on the strength of that advertisement, because he destroyed confidence.

I am going to speak just a minute here about window display. It seems to me that the average gas company, as I see it over the country, does not take nearly the advantage it might of window-display advertising. Confidence is either destroyed or secured through the window. I like to look at the windows of an institution as the eyes of the institution. You and I don't like to do business with bleareyed people. In Salt Lake City a number of years ago I saw down a side street in electric letters, "Par Excellent." I thought I would like to find out what it referred to, so the next day I went to see what it was that they advertised "par excellent." It was a house-furnishings store with most excellent equipment, beautiful inside; but as I went in something jarred me. I didn't know what it was until I came out—but there at my right was a window in which there must have been ten thousand dead flies, and littered over with dirt and dust. That man was losing the confidence and losing the business of the people because he was not keeping the window up to the standard of the rest of his business.

Let us take the correspondence of an institution, I wonder how many of you remember the first love letter you ever wrote. I well remember mine. I went down to the store and bought some good stationery; I did not buy the best. (I believe that it is not necessary to spend all your money on the quality of paper that you write on, but I do believe that the letterhead ought to be a dignified proposition). I went to my room and locked the door and wrote that first letter. I didn't like it. I put it aside and wrote a second. I put the second, third and fourth aside and finally wrote five letters. Then I selected the one that I thought best. I did not realize at that time that I was trying to get the confidence of that young lady, but that was what I was after. I wanted to put that letter in such shape that it would not in any way jar the confidence that I hoped she already had in me. I selected a letter. I wrote the envelope as carefully as I could. I stamped it and I sealed it and then I carried it with my own hands and dropped it in the box. That was as far as I could go. I was sorry I couldn't go farther, but all through that transaction I was trying to get her confidence. Do you realize, gentlemen, that in your business many times a high salaried correspondent's work is destroyed by some cheap, inefficient office boy, not because he wants to do wrong but because he is not properly coached. In a Missouri town, one night, I was talking along this line and the secretary of the Y. M. C. A. came to me and said, "Mr. Tolles, I would like to have you come over to my office." I told him if I had time I would be glad to do so. The next morning I walked into his office and he took out of his pocket an envelope and laid it down and said, "You know we are about to refurnish this building. There is a big amount

of money to be spent in furniture. We have been negotiating with a number of concerns and I had practically made up my mind that we would utilize the product of a St. Louis firm, but when I got this letter I hesitated and I didn't know until I heard you talk last night what it was that made me hesitate." He took out the letter, which was business like; the letterhead was all right, but it had been folded in a very irregular way and slapped into the envelope. He said, "I see that if this firm is careless about their transactions with me before they get my business, what will they do after they get it? I can expect that the goods may be shipped incorrectly, that they may be poorly packed, and that there may be one after another dissatisfaction." The whole transaction rested upon the folding of that letter, and that firm to day has never enjoyed that Y. M. C. A.'s patronage. Now these are little things, but I maintain that we are judged more by the little things than by the big things in business.

Next consider the telephone. How many of you have taken up the receiver and heard someone say, "Hello! What do you want? No, we can't do that! Good-bye!" and slam down the receiver. Confidence is either gotten or destroyed over the telephone, and I maintain that the average telephone on the average desk is not 10 per cent. efficient. In the first place there is not one man out of ten that knows how to answer a telephone call. If I have an office I want to have those first impressions right. The office girl, or the one that gets the business, I want a good looking girl; I want her dignified; I want her to typify the spirit of the institution; and over the telephone you want to put the most persuasive, attractive voice, one that has "come hither" in it. I can show you in Los Angeles where a man went into a laundry concern told them that he could double the business in any territory they had by the proper use of the telephone. They said, "We have one territory where I am thinking of taking the wagon off because we can't get enough business to support a wagon." He said, "I will make that a prosperous route for you under certain conditions." The conditions were subscribed to; and within 3 months they cut that district in two, and had two wagons instead of one to collect and distribute the laundry. Every bit of the business was done over the telephone. In Chicago I can take you to an office of a man that solicits coal for a radius of 500 miles around Chicago and never leaves his desk. He pays for long distance calls to his customers, and he develops new customers. He told me that he knew the name of every long distance telephone girl on the route and he had them all working for him. I maintain, gentlemen, that if you will go home and use the telephone the way that it is possible for you to use it, you will get results which will far exceed anything that you would ever expect. But it is important that that "come hither" should be put in telephone service.

The next thing I want to call your attention to is the billing. In the office of a Philadelphia merchant I saw a stack of bills on his desk and he was fumbling each one of them individually. I knew him fairly well and I said to him, "Do you mean to tell me that you can afford to take the time of the most valuable man in this institution to look over every bill? You can get an eight-dollar-a-week clerk to do that. I can't understand why you do it." He said, "I will tell you, Mr. Tolles. Those people have my merchandise and they have my money too. I want them to have my merchandise but I want the money, and I can't afford to have anything go out in the shape of a bill that will be subject to the least criticism. Therefore, I want the bill neat, I want it accurate, I want it punctuated." One of the evils which is hard to handle in your business are the complaints that come from bills being too high or something of that sort. Confidence is either gotten or destroyed through the billing service.

How many times you see a first-class institution represented in delivery service on the street by an old rattle-trap wagon, unvarnished and not kept up, drawn by an old raw-boned horse, with harness that has never been polished, or tied together with strings, and driven by a boy with his feet on the dashboard and a cigarette in his mouth. A good institution represented that way on the street! I maintain that the delivery service is tested by, "does it get or destroy confidence?" You know that bill board advertising is one of the effective and high-priced ways of advertising, and yet there is a bill board going up and down the streets advertising that institution. I maintain that those little things either help or hinder the business.

Now what have we here? Back of your salesmenship, back of your advertising, back of your window display, back of your correspondence, telephone, billing and delivery, there is a human being. I was very much interested and I am sorry that I was not here to hear that talk yesterday on co-operation between gas company and dealer, I am here to plead for a closer co-operrtion between proprietor and employee, and I believe that we are coming to a profit sharing way of handling the employee. I am not here to discuss that phase this morning, but back of each one of those things is a human being, and that human being is just like you and like me, susceptible to all the influences, to the environment, to the atmosphere, to co-operation. Now I will complete this figure which I call the whirl-a-gig of business, and let it all revolve around the thing that you can't see here—confidence, the unseen and yet the most tangible thing in business. There is your cap stone of confidence. Under that confidence that you inspire in your community is the personality of the individual, the total personality. Someone has said, that no institution is greater than the elongated shadow of a single being, and so your institution is no greater than your ideals worked out in your organization; your personality. And what is personality?

I was organizing a class in our work in San Francisco for a concern, and when the preliminary lecture was delivered all voted to join except one man, the highest in production of sales. The proprietor the next morning said to me, Mr. Tolles, I would like to have you have a talk with this fellow." I went to him and said, "I understand that you are not going to take the course. Why not?" "Well, I don't need it. When those fellows get up to the point where they can produce as much as I do I will take some means to keep ahead of them." I said, "I want to ask you a few questions. How do you get your business?" "Why," he said, "I depend upon my personality." I said, "What is personaiity?" "Well," he says, "Personality is, let me see, personality is——" (he was rather a good looking fellow). "Well, really, if I told you what I thought personality was you would think I was flattering myself," so I take it he thought personality was good looks. I said, "When a man fails to do what you want and puts up an objection to your proposition, how do you answer him?" "Oh, I would depend upon my intuition." I said, "Is that so? What is intuition?" "Now, let me see. Intuition is ——, well, that is a pretty big question. I would have to frame up a definition. I couldn't tell you just exactly what I consider intuition." I said, "You tell me that you get your business through your personality and you handle your objections through your intuition; and yet you can't tell me what either one of them is."

There are lots of business men doing business that don't know how they are doing it. Education is saturating the atmosphere of business to-day. We are trying to find out how and why we do things. Someone quite recently said that the greatest work that would be studied in the next ten or fifteen years in business would be phychology, which is nothing more than the study of the human mind. Business is done in the mind, it is not done in the pocketbook; it is not done over the telephone; it is a mental operation. Now, I will tell you what I think personality is. Personality is that thing which rings true in a man's voice, that flashes sincerity in his eye; that which in every word, deed and thought of the man is calculated to do just one thing—to inspire confidence. When we realize that we will handle people differently. Personality rests upon the mind and the body of the individual. The total of the mental and the physical qualities make up a man's personality. There is no such thing as a perfect mind in the diseased body. Therefore, the importance of keeping the physical in good shape. Then we have the power to endure under the mental; the whole psychological division, the thinking, the feeling and the will power. I wish that I might have the time to go into the psychological part, but under the thinking we have such qualities as observation, concentration, memory, judgment, reason and imagination, all qualities of the intellect. The present tense is thinking, the past tense is remembering, the future tense imagining; and what you men are doing here is storing up ideas imagining that you will be able to use them in the future. You are right now imagining what you are going to do when you leave this hall. We can construct images in our minds of what we are going to do and plan our days and our work as the architect plans the construction of a building.

In a Western coast town I met a man who had been in business 3½ years. He said, "When I started in business I made out a chart of where my business was going to be in 5 years. At the end of the first year this is what I estimated," and he showed me the balance sheet, saying, "This is what we produced. The second year we overlapped it just a little, and the third year we just equalled it, and if we keep on for the next two months we are going to exceed just a trifle the fourth year's estimate." In other words he had planned his business 5 years ahead; and I believe we are coming to a time

(*Continued on page* 186.)

THE AMERICAN GAS LIGHT JOURNAL INC.

Entered at the Post Office, New York City, as Second-Class Matter.

Published weekly at 42 Pine Street, New York City.

Telephone Call, John, 2996. Cable, Am-Gas.

E. P. CALLENDER, President.
A. M. CALLENDER, Vice-President and Treasurer.
CHARLES H. WADELTON, Secretary and Manager.

SANFORD K. CAMPBELL, Editor.

Agents—American News Co., 11 Park Place, New York City.
Lemcke & Buechner, Berlin, Germany.
Aug. Siegle, 30 Lime Street, London, England.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico, $3 per year. Canada, $4 per year. All other countries, $5 per year.
Single Copies, 10 Cents.

NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, SEPTEMBER 21, 1914.

[Official Notice.]

Eighth Annual Convention, Illuminating Engineering Society.

Cleveland, O.,
September 21st to 26th, 1914.

All preparations have been completed for the reception of delegates and guests at the coming Convention of the Illuminating Engineering Society, to be held in Cleveland, September 21st to 26th. The Hollenden Hotel has been selected as Headquarters, where reservations may be made direct by delegates and guests or, should they prefer doing so, requests may be made for reservations through the Chairman of the Hotel Committee, Mr. A. G. Summerell, who can be addressed care National Carbon Company, Cleveland, Ohio.

Program of Papers.

Monday, Septemder 21st.

Morning Session, 10:30 to 12:30.

- Opening Meeting for ladies and gentlemen.
- Assembly.
- Address of Welcome.
- Response.
- Presidential Address—C. O. Bond.
- Report of Committee on Progress.
- Report of Committee on Research.

Afternoon Session, 2 to 5.

- Color of Illuminants—L. A. Jones.
- Artificial Daylight; its Production and Use—M. Luckiesh and F. E. Cady.
- Development of Daylight Glass—E. J. Brady.

Tuesday, September 22nd.

Morning Session, 9:30 to 12:30.

- Relation of Light to the Critical Inspection of Documents—A. S. Osborn.
- Planning for Daylight and Sunlight in Buildings—L. B. Marks and J. E. Woodwell.
- Air Shaft Illumination as Studied by Models—C. H. Sharp.

Evening Lecture Session, 8:15 to 10:15.

- Photo Sculpturing and the Use of Light in the Reproduction and Illumination of Sculpture—John Hammond Smith.
- Color Photography—M. C. Rypinski.

Wednesday, September 23rd.

Morning Commercial Session, 9:30 to 12:30.

- The Locomotive Headlight—J. L. Minick.
- Present Practice in the use of Tungston Filament Lamps for the Lighting of Metal Working Plants—A. L. Powell and R. R. Harrington.
- Factory Lighting—O. R. Hogue and A. O. Dicker.

Morning Laboratory Session, 9:30 to 12:30.

- Light Filters for use in Photometry—C. E. K. Mees.
- Experiments with Colored Absorbing Solution for use in Heterochromatic Photometry—H. E. Ives and E. F. Kingsbury.
- Characteristic Equations of Tungsten Filament Lamps and their Application in Heterochromatic Photometry—G. W. Middlekauff and J. F. Skigland.
- A Transmission and Absorption Photometer for Small Areas—P. G. Nutting and L. A. Jones.

Afternoon Commercial Session, 2 to 5.

- Recent Improvements in Incandescent Gas Lighting—R. F. Pierce.
- Characteristics of Gas-Filled Lamps—(. M. C. MacKay.
- The Lighting of Rooms through Translucent Glass Ceilings.

Afternoon Laboratory Session, 2 to 5.

- Mixed Specular and Diffuse Reflection—P. G. Nutting.
- Notes on Integrating Sphere and Arc Lamp Photometry—N. K. Chaney and E. L. Clark.
- A New Standard Light Source—L. A. Jones.
- Some Tests of Possible Reflecting Power Standards—P. G. Nutting, L. A. Jones and F. A. Elliott.

Thursday, September 24th.

Morning Session, 9:30 to 12:30.

- Some Uses of Light in the Treatment of Disease—E. C. Titus.
- Some Experiments with the Ferree Test for Eye Fatigue—J. R. Cravath.
- Further Experiments on the Efficiency of the Eye under Different Conditions of Lighting—C. E. Ferree and G. Rand.

Afternoon or Evening Session, 7:30 to 8:30.

- The Visibility of Radiation—P. G. Nutting.
- Some Recent Experiments on Vision in Animals—H. M. Johnson.

[Special Editorial Correspondence,.]

SEVENTH ANNUAL MEETING, CANADIAN GAS ASSOCIATION.

Ottawa, Ont., September 17, 1914.

The Canadian Gas Association opened its seventh annual convention in the Assembly room of the Chateau Laurier promptly at 9:30 this morning; President Dion presiding, and a very large number of members in attendance. After the address of welcome by Mayor McViety, of Ottawa, and a suitable reply, the regular order of business was inaugurated.

Secretary Keillor, in his report, showed an increasing membership list and substantial financial balance on the right side. Mr. Hewitt, in presenting the Report of the Executive Committee, referred to the great loss sustained by the Canadian Gas Association through the death of Mr. T. J. Cunningham, who had represented the American Gas Light Journal at every Canadian convention since the formation of the Association, and whose genial presence and sound advice would be very much missed by the gas men of America.

The first paper presented was that by Mr. John T. Haug, of Montreal, "Notes on the Design of Gas Condensers," which opened up a very interesting discussion on the treatment of gas. Mr. Howard E. Mann then read his paper, "Switching the Foul Box Last," giving all that is latest and best in purifying practice. Next came Mr. George W. Allen's paper on "Advertising to Sell Gas," illustrated by lantern slides, descriptive of Toronto's methods of publicity.

Upon adjournment of the session, the members and their ladies took cars to the Country Club, on the Quebec side of the river, where a delightful luncheon was served; after which was an opportunity to visit the Exposition at the Ottawa Fair Grounds, and other points of interest in the city. To-night is the Smoking Concert in the Ball Room of Chateau Laurier, and a theatre party for the ladies.

To-morrow's papers are on important subjects, "Gas Fired Steam Boilers," by Mr. H. E. G. Watson, and "Commercial Lighting," by Mr. W. Kennedy. There are also some interesting shorttopics to be discussed: "The Stanardization of Meter Connections," "Prepay Meter Thefts," "Proposed Government Regulations," and "What Step Should be Taken to Extend the Membership of the Association."—A. G. N.

BRIEFLY TOLD.

AMERICAN GAS INSTITUTE CONVENTION ARRANGEMENTS.—The ninth annual meeting of the American Gas Institute will be held in New York, October 20, 21, 22. and 23, 1914. The lecture on the evening of Tuesday, October 20, and all of the regular sessions will be held in the Engineering Building, 29 West 39th Street, between Fifth and Sixth Avenues. The registration bureau and booths, from which will be distributed and in which can be deposited between sessions, copies of the convention reports and papers, will be on the ground floor, and the office of the Secretary will be on the 8th floor. The main auditorium, which seats 1,200 persons, has been engaged for Tuesday evening, and for the other days on which regular meetings will be held, and for Thursday 3 additional assembly rooms have been engaged. These arrangements assure ample comfortable space under one roof for all sessions. Bulletin boards will be provided in each meeting place, upon which will be indicated the papers about to be, and being read in each of the four sessions, which will give members an opportunity to select papers in which they are particularly interested.

On Wednesday and Thursday a buffet luncheon will be served at a nominal charge in Room No. 1. This will tend to keep the members together, and during the lunches an opportunity will be given for those in attendance to get together and renew old and make new acquaintanceships.

The Hotel Astor has been selected as Convention Headquarters. In the north and east ballrooms, on Wednesday evening, will be held the reception to the present and past Presidents. This will be the principal social function of the convention, and there will be dancing for the guests; and an effort will be made to obtain some attractive additional entertainment. Admission will be by ticket only.

The main ballroom in which on Thursday evening, the annual banquet will be held, is one of the finest banquet halls in America, and the fact that a dinner is provided by Messrs. Muschenheim is a sure guarantee that it will be of the best.

Theatre parties for the ladies will be arranged for the evening on which the banquet is held, after which the ladies are cordially invited to come to the balcony of the banquet hall if they so desire.

For those members of the Institute who are interested in golf and other country club attractions arrangement has been made for the use of the Sleepy Hollow Country Club at Scarborough-on-the-Hudson, which is one of the most beautiful and exclusive country clubs in the Metropolitan District.

The tentative programme for the three days sessions is as follows:

WEDNESDAY, OCTOBER 21, 10 A.M. to 12:30 P.M.

Institute Meeeting.

Report of Board of Directors.
President's Address.
Committee Reports.
Other Institute Business.

WEDNESDAY, OCTOBER 21, 2 to 5:30 P.M.

Manufacturing Section.

Refractory Materials for Coal and Water Gas Works, by Herman Russell, Chairman.
Oil Tar Separation, Recovery and Disposal, by R. E. Wyant.
Coal Gas Residuals, by F. H. Wagner.
Operating Experiences under a Calorific Standard. Symposium.
Efficiency Relation Existing between Various Test Burners, both Argand and Open Flame, by F. H. Gilpin.

Distribution Section.

The Welding of High Pressure Mains, by J. D. Shattuck.
The Installation and Maintenance of Services, by R. B. Duncan.
The Installation, Repairing and Testing of Meters by a Small Company, by Charles Otten, Jr.
The Improvement of Distribution Employees, by C. E. Reinicker.

THURSDAY, OCTOBER 22, 10 A.M. to 12:30 P.M.

Manufacturing Section.

The Year's Progress in Carbonization Methods, by E. L. Spencer, Chairman.
Carbonization in Bulk, by C. J. Ramsburg.
The Operation of Inclined Retorts, by Frank Huber.

Chemical Section.

Gas Chemist's Hand Book, by W. H. Fulweiler.
An Electrical Process for Detarring Gas, by F. W. Steere.
A Method for the Determination of Hydrogen Sulphide in Gas, by A. B. Way.

Distribution Section.

The Proper Specifications for, and Inspection of, Interior Gas Piping, by A. E. Turner.
Piping of Large Buildings for Gas, by O. H. Fogg, Chairman.
Utilization of Gas Appliances, by W. J. Serrill, Chairman.

Accounting Section.

Estimating Accruing Depreciation and Features in Connection Therewith as Related to Matters of Accountancy, by Dr. A. C. Humphreys.
Accounting for Depreciation, by Halford Erickson.

THURSDAY, OCTOBER 22, 2 to 5:30 P.M.

Manufacturing Section.

Methods and Facilities for Specifying and Testing Blowers, also Measuring Air and Steam Supply to the Water Gas Generators, by J. M. Spitzglass.
Measurement of Gas in Large Volumes, by Dr. J. F. Wing, Chairman.
Purifiers, by C. E. Paige.
Care and Maintenance of Gas Holders, by J. H. Braine.

Chemical Section.

Ammonia Purification, by V. von Starzenski.
The Fusibility of Ash in Coals Used in Gas Making, by Perry Barker.
The Mode of the Decomposition of Coal by Heat, by Dr. H. C. Porter.
Gas Manufacture from the Point of View of Physical Chemistry, by W. F. Rittman.

Illumination Section.

Illumination by Gas: Its Present Status and Its Future, by C. O. Bond, Chairman.
The Physical Installation of Gas Arcs, by C. A. Luther.

Accounting Section.

Compensation of Meter Readers, by H. C. Schaper.
Printing and the Care of Printed Stock, by W. P. Baylie,
An Extension of the Dewey Decimal Classification System to Gas Engineering, by D. S. Knauss.
Rate Making, by William McClellan, Chairman.

FRIDAY, OCTOBER 23, 10 A.M. to 12:30 P.M.

Institute Meeting.

Unfinished Business.

GAS APPLIANCE MANUFACTURERS' ASSOCIATION.—At a meeting of the Gas Appliance Manufacturers' Association, in the Hotel McAlpin, September 9th, to complete their organization, a letter from Mr. P. S. Young, President of the National Commercial Gas Association, was read, extending an invitation to become a Manufacturers Section of the N. C. G. A., with representation on the Board of Directors. The suggestion was well received, and after some discussion it was unanimously decided to accept the invitation. A committee was appointed to meet with Mr. Young to carry out the necessary details for the formation of the Manufacturers Section. The committee is Messrs. William M. Crane, Russell Sard. Charles W. Wardell, H. D. Schall and Will W. Barnes.

HIGH PRICED MEN IN OHIO.—In order to be in position to make appraisals as requested by municipalities throughout Ohio, the Public Utilities Commission has appointed twenty appraisal engineers and ten appraisal clerks. The selections were made from lists certified to the commission by the State Civil Service Commission, before which the applicants took competitive examinations. The salary paid to the new appointees is $125 per month. It is probable that the commission will now be able to make requested appraisals more promptly than in the past.

ANTHRACENE OIL FREE OF DUTY.—The Treasury Deparment has put an end to the diversity of classification under the present tariff law of anthracene oil by issuing an order to officials of the customs that when the oil is of a specific gravity of from 1 to 1.13 and yields a distillate of 50 per cent. or more, from 270° to 400° C., it is free of duty under Paragraph 452. Assistant Secretary Peters, in a circular letter to Collectors and other officers of the customs, says that coal tar oils possessing the properties of the specimen mentioned are entitled to duty exemption. Such oils may or may not contain crystallized anthracene.

(*Continued from page* 183.)

when we will build our organization strong enough and big enough to work out the image or ideal of the steps. Many of us are doing to-day just what we wished to accomplish. Some men think and others just think they think, but it is an important thing to know what we think and how we think in order that we can construct our thinking to more successful ends.

Under the feelings we have faith, ambition, love, reverence, honesty, and enthusiasm which give us the man of reliability. You know as well as I do that the thing that raises pay to-day is reliability. The greatest thing in the world is reliability. You and I want that man who stands where he is hitched; the fellow that will say to our back exactly the same things he says to our face; the fellow that will perform in our absence exactly the same as in our presence. But reliability is not enough. We want something else. We want the man who has decision, activity, perseverance, punctuality. Every one of these can be stated as a law. If you would be successful you must be punctual, and the man who violates a law is a criminal and many of us are criminals in the violation of these laws. It is a law that if you want to be successful you must have a good memory; if you want to have success you must have physical endurance, and when we violate nature's laws we pay the penalty, not the other fellow. If I have an appointment with you at 3 o'clock and don't get there until 3:30 you say I have made you suffer, but I suffer. I have to pay the penality for the violation of that law. So we need the man of action. These qualities developed make the all-round man in business. Here we have Ability, plus Reliability, plus Endurance, plus Action. I maintain that that equals success, A=R=E=A. The area of any man determines the degree of his success. You add the plus sign and the letters together and you will find that they count up just 36. Someone has called this the yardstick of business, by which you can measure the efficiency of anybody. The only way that men differ physically is in the degree of development of their physical parts. Every one of those 60 attributes (I have enumerated just a few of them), every one of those 60 qualities every normal minded man has; and the only way you and I differ is in the degree of the development of those qualities. You can talk about the development of your men along the technique of your business, and that is important, but proprietors all over the country are coming to recognize the truth that their responsibility does not stop when the pay envelope is filled. I was asked when I was employed in New York city how much I was earning. I said, "My job is worth $5,000 a year." "Why," said a friend, "You know you are only getting $2,500. What do you want to lie like that for?" I said, "I didn't lie, I told the truth. The experience I am getting out of this job, the training I am getting here, is worth to me what I get in the pay envelope, and it would need a $5,000 attraction to take me away from this job." That is one of the biggest things in business, to get your men to recognize that you are teaching and building every day, and that by staying with you they are going to be better off a year hence.

A little story here might not be amiss. One day when I was in Mr. Wanamaker's private office a man came in to make a report on a letter of complaint. He said to Mr. Wanamaker, "This lady purchased a rug on Tuesday and we promised to deliver it in Atlantic City by Saturday for a week-end house party. The rug was delivered Monday." Mr. Wanamaker said, "Have you anything further to report?" "No. I have found that what that lady says is true." Mr. Wanamaker said, "Do you suppose that she would write me a personal letter and state what was not true? I believe what she says. That is not what I wanted you to find out. I want you to find why it happened; who made the error; and suggest a way by which it can be prevented in the future. I am not going to be satisfied until you furnish me a satisfactory report?" "Well," he says, "This was shipped from the Muir building," which was a couple of blocks away. Mr. Wanamaker came down with his fist on the desk and said, "I want to tell you that I am going to correct this evil if I have to move the entire Muir building over into this building. We can't have a thing of this kind going on." The man went out. Mr. Wanamaker said to me, "Mr. Tolles, that man has been in my employ for 17 years and I have promoted men over him right along, and he does not understand why he is in the same old place." Then he told me this story which is applicable to the point I was about to make. He said that when a boy he was earning three dollars and fifty cents a week in a grocery store on Market street. The proprietor of another store came to him and said, "John, I like the way you work. I would like to have you come and work for me." John said, "I can't do it." "Why not?" "Well, I can't." "How much money are you making?" "Three dollars and fifty cents." "I will give you four dollars and fifty cents," says the merchant. "No, I can't do it." "Why, don't you realize that that is fifty-two dollars a year more than you are earning now. Don't you need the money?" John said, laughing, "Yes, I do need the money," and he told me he had needed it ever since even though he is a millionaire. "Well," he said, "Why can't you come then?" Mr. Wanamaker said, "Well, I will tell you. I haven't learned all that is to learn in this store yet. When I learn all that is to be learned here and you offer me a position where I can learn more from you than I am learning here, then I will come at the same figure." I believe that if the men in your organizations could know that story and be saturated with that truth and could realize that they are learning more or as much, at least, as they are earning, that you would see them sticking on the payroll longer. Now every one of those questions, by education, can be handled exactly as the development of muscles, by food and exercise.

I can develop the mental muscle by proper food and proper exercise. Properly feed and nourish and use any quality and that quality will grow; so, properly feed and nourish the body and you have more endurance; properly feed and exercise these mental qualities and you have more ability, reliability and action, and that gives a stronger personality. With a stronger personality we can inspire more confidence; and with a stronger organization inspiring confidence we can handle the advertising more successfully; the window display, the correspondence, the telephone, the billing and the delivery. Our power in the community to persuade is going to be greater and, naturally, we are going to have a more permanent and profitable business, and that I call my whirl-a-gig of business.

There is just one other point that I want to make, and I don't want to be misunderstood. I attended your banquet and I enjoyed it very much. I have been to many banquets where I blushed because of the things I heard, and I congratulate you upon the way your banquet was carried off. I maintain that you can poison the mind just as you can poison the body, and the average man to-day is feeding his mind upon husks instead of nourishing mental food to make him a bigger and a better man. Every word, everything that you have ever heard, seen, smelt, touched and tasted has been taken in over sensory nerves and are indellibly recorded in your mind. The total of all those impressions received, plus the use that we have made of them, and the food that we feed our minds upon is either good food or bad food. Much is being said nowadays about the pure food law. How I wish it were possible, and I believe this organization may help to bring it about, I wish it were possible to so label every story with a certificate that it is pure mental food before it is told. I believe that you agree with me, and if you do I would like to have you not sign a pledge or contribute any money or indicate anything other than that you go out of this meeting with a determination that, "I am going to do all that I can to use my influence to keep pure mental food before people, and not poisonous mental food."

A good many salesmen are like the railroads that run into Chicago, they lack terminal facilities The best terminal that I have ever found for an address of this kind is that old Arabian proverb with which many of you are, no doubt, familiar. Man is four, that is, there are four kinds of men in this world:

"He who knows and knows that he knows;
He is wise, follow him."

There are only a few leaders.

"He who knows and knows not that he knows;
He is asleep, wake him."

Many people just need to be awakened a little and off they go.

"He who knows not and knows not that he knows not;
He is a fool, shun him."

The worst disease that afflicts men in business to-day is the disease of know-it-all-itis, which is a much more dreadful disease than appendicitis. My experience in handling men teaches me it is one of the most difficult things that any one ever tried to get the fellow who is afflicted with the disease of know-it-all-itis to learn anything from anyone else. Now the last:

"He who knows not and knows that he knows not;
He is a child, teach him."

So, we should commence when we are willing to humble ourselves as little children, to recognize that we can learn from each other; and one of the splendid things that I see here is the fact that you men are eager to learn from one another, and you put yourselves in that class and pass your endorsement on the class that knows not and knows it.

Gas Standards in Ohio.

In an address at the annual meeting of the Natural Gas Association of America, held recently in St. Louis, Mr. C. V. Critchfield, gas expert of the Ohio Public Utilities Commission, said in part:

"Since the recent meeting of the Ohio Gas Association, at which a number of you gentlemen were present, some members of that Association have suggested certain changes in our requirements. One was the question of testing meters. In West Virginia and, I believe, in New York, and several other States, it is the policy to test all meters, whether new or old. I thought in formulating our rules it was possibly a hardship to test a new meter if it involved the purchase of quite a stock of meters. In the case of a small company I could see where it might work a hardship. But it is a rule in nearly all the States that each company is supposed to have on hand 50 to 100 or more meters, depending on the size of the company, and that the inspector should call and test these meters. A probable advantage was brought to my attention, that the public would feel that a new meter, if tested by the Commission, would bear the stamp of accuracy and have the approval of the State upon it, and many companies have thought it worth while to go to the expense of having a certain amount of money tied up in those meters for the purpose of saying to prospective consumers that the meter to be installed has been inspected by the Commission.

"I am quite sure the State Commission will be very glad to change that rule as it now stands to providing for the testing of new meters. Besides the routine test which the company makes periodically (if it is the desire of the gas companies), the Commission will be glad to test all new meters. I believe that would be hailed with delight by some of the people in Ohio, because it would probably add to the number of employees of the Commission and furnish some posts of duty for the hungry politicians, who are willing and anxious to get into the employ of the State. But as the rule stands now, it is confined to the testing of meters complained of by the consumer. We have an old statute in Ohio which provides that a company shall be charged with the cost of taking the meter out and returning it to its original position if the meter shows an error greater than 3 per cent. Otherwise the consumer pays for it. However, I have found that companies are waiving the provision of this statute.

"We are undertaking, or will undertake, to test proportional meters, and I have been anxious to learn what natural gas men consider an adequate test of a proportional meter. I would like to hear that question discussed as to what is the best method of testing a proportional meter. There seems to be two or three methods and it is a question that ought to be discussed by you. Of course, the old method of testing a straight meter by a prover is probably the best. But as the public learns more about the scope of the work of the Commission they are coming in larger numbers with their individual troubles and we get now and then a case where it is a proportional meter to be tested.

"As I understand the functions of the Ohio Commission it has jurisdiction over certain kinds of business. Although the laws of Ohio do not definitely define a 'public utility,' they pick out certain kinds of business and call them 'public utilities.' Our law designates them as gas companies, water companies, electric light companies telephone companies, street railway companies, steam railroad companies, express companies, depot companies, etc. In other words, you cannot find in our law a definition of what a public utility is, but you can find a category of the various businesses that are public utilities within the State, and those companies are under control of the Commission.

"It seems that our Commission has three functions. One is the supervision of the issues of securities, such as stocks and bonds. Then it has jurisdiction in the matter of rates, and as to discriminations in rates. A public utility, such as I have indicated, is required to file with the Commission schedules showing classifications of the various kinds of service that it proposes to perform. Those classifications in some instances as, for example, in the case of natural gas companies, extend into six divisions, and each classification is defined and the rate to be charged for the service set forth.

I find that classification is based on about five elements; one is the matter of quantity; another, time or duration. For instance, electric light companies furnishing electricity in the day and during the night season. That would be an illustration of what is meant by 'duration' or 'time.' Then we have a basis of preferment, that has come out recently in cases before the Commission. Suppose I sell John Jones gas at a certain price and he wants it all the time, and as long as you have gas to deliver to him. Whereas William Smith is willing to take gas just when you have gas for him, and he gets it at a cheaper rate. That would be sale of gas on a schedule based on preference. Then there is also the element as to what you are going to use it for. We have had some discussion as to the use of gas in gas engines as distinguished from its use for other power purposes: and gas burned under boilers and the energy supplied by means of the steam thus generated. So that, as I say, schedules are based upon these five different factors, and that is one of the functions of the Commission so far as it affects rates, and it crops out largely in the matter of discrimination. Then they have the third function of fixing rates by values. Up until about three months ago rates were fixed in Ohio in two ways. First, the municipality or the political subdivision in which you were operating fixed the rate usually by ordinance or franchise. If the franchise or ordinance granted by the Council did not satisfy the utility men it could appeal to the Commission. If there was no ordinance, and the Company on its own volition fixed the rate, then the Council or an individual consumer, and possibly a citizen not a consumer, could come before the Commission and appeal from the rate. In those cases it turns on the value of the property involved, or, to use the language of the statutes, 'ascertain the value of the property of any public utility used and useful for service and convenience of the public.' That not only meant the tangible assets, the things that you could see and feel, but also certain intangible values, as, for example, the cost of developing the business and certain incidents connected with the organization of the Company."

"New" or "Double" Gas for Small Works.

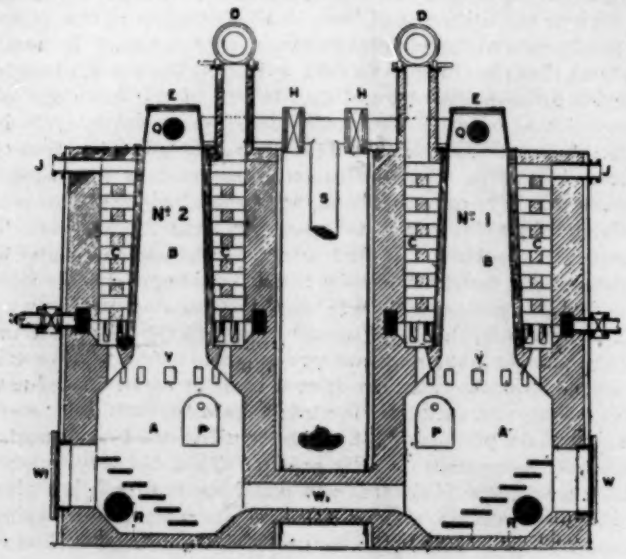
[By C. R. Tully, in *London Journal.*]

"New" or "Double" gas is the name given to the gas resulting from the complete gasification of coal and the generation of water gas from the resulting coke in one combined plant. This process can scarcely be called "new," as it has been carried on for some years with generators similar to that advocated by Professor Strache. The first generator of this kind was erected at Sligo some 10 years ago, and was followed by plants at Truro, Swindon, St. Mary Church and several other works in England and on the Coutinent, and many others are now in course of construction.

It is usual practice with these plants, when a large amount of diluting gas is required, to fill the upper or retort chamber of the generator with coal of a semi-caking quality, or a good coking cannel, or a mixture of coal and coke, with the result that a gas testing between 380 and 400 B.T.U. is obtained. This generator was referred to by the author at one of the Irish Gas Asscciations meetings many years ago. Although coal is used in these plants when a rich gas is required, it is not the general practice to do so, as the real object in this country is to dispose of the coke and take it off the market. By this means a very much better price is obtained for it. The conditions of the oil and benzol markets have undergone several changes during the last 10 years. At that time it was a question of the disposal of coke and tar, and enrichment with benzol. At the present time it is a question of the disposal of the coke or to restrict production of that article. As tar finds a ready market at 3d. per gallon, gas oil, even at its present price, is cheaper than tar for enrichment. Benzol, at 1s. 4d. per gallon, is much too expensive. There is no doubt the cheapest and best enricher is good coal gas. Having a water gas plant it is better to carbonize at a low temperature, to produce rich gas, with a good useful coke, and to dilute with water gas to the required standard, and depend upon the coal gas enrichment alone. By far the best plan, however, is to dispense with enrichment altogether, and supply such gas as can be be obtained from the complete gasification of the coal, without any residual coke—leaving only tar and ammonia as residuals. Even then, if it is advisable, the tar can be used in the generator for the production of gas. This will dispose of the trouble and worry of the coke market, and be financially better for both consumer and shareholder. The variation from time to time in the values of coke, oil and benzol affects the economical utility of various carburetted and other water gas plants in use. This has caused manufacturers of these plants to modify and alter their designs, with the result that there are plants now designed that will use any class of fuel or enricher and enable advantage to be taken of the cheapest at the time being on the market, and at the same time produce gas of equal quality.

There are no doubt great possibilities for "Double" gas plants in

small gas works, where they can be economically and profitably used to produce all the gas required—substituting "Double" gas of 380 B. T. U. for coal gas of about 550 B.T.U. The plant of this description most likely to meet all the requirements of small gas works is the "twin generator" type, as illustrated, where the two fires are blown



Twin "Double" Gas Plant.

A, Producers *B*, Coal Retorts. *C*, Regenerators. *D*, Stack Valves. *E*, Charging Doors. *H*, Gas Valves. *J*, Oil and Steam. *P*, Flue. *Q*, Gas Outlet. *R*, Blast. *S*, To Scrubbers. *X*, Air. *W*, Gas Duct. *WI*, Clinkering Doors. *Y*, Nostrils.

together and worked in series. The advantage of this type of plant is that when repairs are necessary to the generator—say, about every 3 years—one generator can be isolated and the other used for the time being for gas making. Minor repairs to the producer walls can be done at any time between the working hours. The plant consists of two cylindrical shells, the bottom part fitted with producers and the upper with vertical retorts, surrounded with chequer brickwork; the two producers being connected at the base by a duct, to convey the gas from one to the other. The producers are "blown" similar to the Dellwik producer, to complete combustion through the nostrils at the proper height. Instead of the hot blast gases going to waste, as in the Dellwik producer, they are utilized to heat the chequer brick and to carbonize the coal in the retort in the upper part of the generator. The hot chequer brick in the annular space round the retorts is also used as a carburettor for oil, when required, and as a superheater for the steam, by which means steam of low pressure or wet steam can be used. A secondary air supply is provided to burn off any combustible gases left in the blast gases, or combustible gas can be made purposely to heat the coal gas retorts and burned in the regenerator.

The chief advantages of this plant are short travel for the blast, quick heats, with less waste of fuel, long travel and consequently longer contact of the steam with the incandscent fuel when making gas. The carbon dioxide left in the annular space or regenerator during the "blow" is swept out by the steam at the commencement of the "run," and converted to carbon monoxide in the producers, instead of being sent forward, to the detriment of the gas. The whole of the rich coal gas is recovered from the coal in the retorts, and it is driven off by the heat from the brickwork in the annular chamber as well as when distilled out by the hot water gas when passing through the retorts.

In this arrangement there are no hot valves to cause trouble. The gas making process being reversed after each blow, the steam is caused to travel through the regenerator, which, during the run, was used for cracking the oil, with the result that the carbon deposit from the oil is scoured off, and used up for the production of water gas, while the brickwork is kept clean and in an efficient state. Befor the end of the run the generators are both reversed for a minute or so, to sweep out the oil gas from the regenerator chamber. The steam in passing through the regenerator, and before reaching the producers, is highly superheated, and acquires still more heat in passing through the producers; but as this passes from one producer to the other without going under the fire-bars, the fire-bars are not in any way affected, nor is there an excessive production of clinker. The fuel chamber is kept full to the top, and can be arranged with a hopper and valve to admit the necessary charge at every run. In this way working is practically continuous, except for clinkering, which is a very simple operation with the step-grate. The coal gas generated in the retorts during the blow is drawn off through the gas outlet by having the gas valve slightly open or by a bye-pass arrangement.

From the illustration the system of working can be plainly seen. The producers are blown to incandescence in parallel by the air blast. Secondary air is introduced for the complete combustion of the producer gases, which pass away through the nostrils, heating up the chequer work in the annular space round the retorts, and away by the stack-valves to the chimney. The time of blowing is about one minute; the heat being quickly obtained, owing to the shallow bed of fuel.

The direction of the run or steam for gas making is reversed after each blow, in one run the steam travels from the generator No. 1 to No. 2. The blast valves and the secondary air and stack valves are closed, and steam is admitted at the top of the chequer brick regenerator. The steam is superheated and passes down through the nostrils. and then through the fuel bed No. 1, and, by way of the gas duct, up through fuel bed No. 2, and through the value X; the valve being opened sufficiently to carry off the coal gas generated in No. 1 retort. At the same time, if required, oil is admitted and cracked in the regenerator of No. 2: passing down through the nostrils and up retort No. 2, and away with the water gas and coal gas. After this run, and when the fires have been blown, the travel is reversed.

By this arrangement double the contact and double the travel are obtained for the steam through the incandescent fuel, and advantage of the shallow bed of fuel and the sharp blast as in the Dellwik plant is obtained, together with that of the deep fuel bed and longer contact with the incandescent fuel.

This arrangement producing a gas having a small percentage of carbon dioxide, is a blending of three processes—the Dellwik with the shallow bed of fuel, the "K. & A." with its double gas generator system, and the "M.H." regenerator and retort chamber. It is a combination which will meet all requirements at the present time, and produce with the utmost economy "Double" gas, blue water gas, carburetted water gas, methane hydrogen gas, coal gas, or a mixed coal gas and producer gas of any quality, as necessity arises.

The economy of the "Double" gas as compared with ordinary coal gas is best shown by comparing the working of a small gas works (5 million cubic feet) when supplying coal gas of 550 B.T.U. at 6s. 3d. per 1,000 cubic feet and when carbonizing coal for the production of "Double" gas of 380 B.T.U.

Five Million Cubic Feet Works with a Capital of £3,000.

Gas made. 4,777,400 cubic feet		
Sold ..... 4,136,900 "		£1,190
640,500 " (unaccounted-for gas).		
Residuals sold		110
Total receipts		£1,300
Coal	£591	
Salaries and wages	286	
Rent, rates, etc	56	
Incidental expenses	45	
Purifying	20	
Repairs and maintenance of works	70	
Total expenditure		1,068
Profit		£232

Same Works Supplying "Double" Gas.

Gas sold ..... 8,273,800 cubic feet at 2s. 6d..		£1,034
Unaccounted-for 640,500		
8,914,300 gas required		
Tar		29
Total receipts		£1,063
Coal—297 tons at 21s	£321	
Wages	286	
Rents, rates, etc	56	
Incidental expenses	45	
Purifying	20	
Repairs and maintenance of works	70	
Total expenditure		789
Profit		£274

These figures are taken from the balance sheet of a small gas works, and for comparison the same items are taken in both cases, with the exception of coal, which in the case of "Double" gas will be considerably less, as will also the labor and repairs and maintenance of works. At this works coal gas costs 4s. 6d. per 1,000 cubic feet to manufacture and distribute, as against 1s. 9d. per 1,000 cubic feet for "Double" gas—a difference of 2s. 9d. per 1,000 cubic feet. As the unaccounted-for gas will be the same for "Double" gas as for coal gas, there must be a considerable saving under this head alone.

It will be seen that supplying "Double" gas at 2s. 6d. per 1,000 cubic feet, the company will make an extra profit of £42, whereas the consumer will have 12,668 B.T.U. for 1d. in the case of "Double" gas, against 8,730 B.T.U. with coal gas—an increase of about 45 per cent.

In arriving at these figures the very low yield of 30,000 cubic feet per ton of coal has been taken in the case of "Double" gas, whereas the average make for intermittent working is about 45,000 cubic feet, and for full work over 60,000 cubic feet are obtained. Allowance has to be made for the gas used for raising steam and stand-by fuel. The make varies with the size of the plant and hours of working per day.

The only objection that can be raised to the use of "Double" gas is its higher toxicity as compared with coal gas; but as many towns on the Continent are being supplied with similar gas, and, moreover, during the coal strike many gas works were sending out carburetted water gas with quite the same proportion of carbon monoxide, without any accidents, there need be no cause for alarm.

The consumer will no doubt willingly take a supply of this gas, in place of coal gas, to save 45 per cent. of his gas bill.

"Double" gas will, no doubt, open a big field for the consumption of gas for heating and hot water circulators, and will be a useful competitor with suction-gas plants. Arrangements are now being made to fit up some small gas works for supplying "Double" gas independently for general purposes, which will be a pioneer movement of importance to the gas industry, and more especially to small struggling gas undertakings.

Safety Co-operation Among Manufacturers.

The Conference Board on Safety and Sanitation is the practical expression of co-operation between employers in their efforts to safeguard the health and lives of their employees. The Board was created on March 23, 1914, when representatives of the National Founders' Association; the National Association of Manufacturers; the National Metal Trades Association; and the National Electric Light Association, met at Buffalo, N. Y., and decided to pool their interest in the safety of employments, and to work jointly. The organization of the Conference Board is a large step forward in co-operative efficiency and economy in the prevention of accidents and the promotion of sanitary conditions in the industrial world. The co-operating national associations, whom, no doubt, other employers' associations will join in the future, comprise industrial managers, engineers and superintendents in every section of the United States and Canada, and represent a great variety of industries. In normal business times the members of these associations employ more than five million employees. Any unified safety action is therefore bound to benefit a vast number of employees and, through its influence upon others, and to carry the benefit of such action to many times that number of industrial workers. The experience of thousands of managers engaged in the many industries represented by the membership, is available to the experts of the Conference Board and provides a most valuable source of information which these experts are free to tap.

The Conference Board has held several meetings since its organization, and is planning to assemble frequently, as often as occasion demands, to consider the progress of the work, study the reports of their experts, and decide upon the methods and devices which should be employed to make employments safe against accidents and industrial diseases.

The primary object of the formation of the Conference Board was to avoid duplication of effort on the part of those who are actively engaged in developing safeguards and safe methods for the protection of workmen, and by co operation of ideas to develop the most satisfactory safety devices and methods. While each of the co-operating associations, through its Safety Committee or Committee on Accident Prevention, studies carefully the safety and sanitation needs of the specific industries which it represents, the work of each committee is finally brought before the Conference Board for a broader discussion by men of varying viewpoint and experience. Much of the field of safety endeavor is of common concern to all employers. Electric lighting is largely used in industrial establishments and the men whose duty requires the handling of electrical circuits need protection against this hazard. Elevators and cranes are found in practically every shop and their safe operation is equally important in all industries. Pulleys and belting and revolving machines of one kind or another, in whatever industrial enterprise employed, can and must be guarded to eliminate accidental injury to employees. Finally, when an employee has sustained an injury, the most effective first aid by the layman must be available and employed for his benefit, without regard to the industry in which the injured is engaged and with reference only to the nature of the injury and the quick availability of expert medical attention. The Conference Board, composed of several men with knowledge, experience and judgment, can decide more correctly on proper methods of prevention or remedy than any of its constituent parts alone.

The Conference Board imprints on the literature which it issues in behalf of the co-operating associations, and on the devices which it standardizes, the National Affiliated Safety Organization trade-mark, indicating thereby that the National Affiliated Safety Organizations have united in specific safety recommendations. It then arranges with competent manufacturers for the production of standardized devices at the most reasonable price. The Conference Board distributes these devices at practically cost price, as it does not intend to profit financially by their sale; it only aims to assist in an effective and practical way in the great humanitarian and economic movement for industrial safety that is to-day rightfully claiming the close attention of the public at large. In pursuance of this policy the Conference Board decided to make the results of its work available to all employers alike, whether or not they are members of the co-operating associations, even though some employers will benefit financially in this way without having contributed through membership toward the expenses of the Conference Board.

To date, the Conference Board has standardized and distributed in large quantities danger and caution signs of various inscriptions, some printed on linen for general application and others made of metal and mounted on stands for use as portable floor type signs, outdoors as well as indoors. Similarly, workmen's shoes adapted for general factory service but of particular value to foundry workers, and foundry leggings for the same purpose, have been especially manufactured for the Conference Board and inspected and distributed by it in large quantities throughout the country. Many managers have reported that the use of such shoes and leggings has reduced, and in many cases practically eliminated, foot burns in their foundries. Improved safety goggles for the protection of workmen's eyes against injury from flying chips, dust from grinding wheels and other sources, splashes from molten metal and excessive glare, have been made under the direction of the Conference Board and now afford effective and comfortable protection to thousands of employees. Shaft casings, consisting of spirally wound pressboard tubes, are now available, and their use is recommended as a protection of the workmen against the danger of contact with revolving shafting.

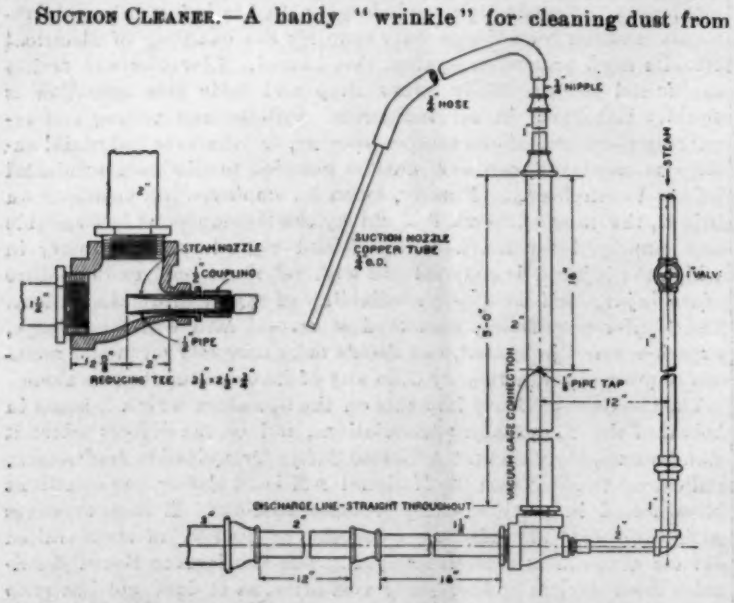
Other protective devices are in the course of development. Announcement will soon be made of the standardization of sanitary stretchers and of sanitary first aid kits. The work on these has progressed well and the indications are that the Conference Board will be able to fill a long felt need for a compact, complete, sanitary and low-priced outfit which will give the layman all necessary paraphernalia with which to render effective first aid to the injured.

The Conference Board is fully alive to the important fact that back of the whole campaign for safety and sanitation must be a persistent effort to educate managers as well as employees to an appreciation of the value of personal endeavor toward the elimination of accidents. It will bend much of its future effort, therefore, in this direction and will in time issue literature to serve this end and to bring home clearly to everyone that PERSONAL CAUTION IS THE GREATEST SAFEGUARD AFTER ALL.

HOMER M. EATON, former manager of the Jackson (Mich.) Gas Company, has been promoted from the same position held in Flint to a similar position at the gas plant in Columbus, Ind., to succeed Glenn R. Davis. Mr. Eaton's departure from Flint will leave a vacancy on the water board of that city, of which he was a member. His departure will be much regretted by the Flint Lodge of Elks, which he heads as exalted leader.

New Methods and Appliances.

SUCTION CLEANER.—A handy "wrinkle" for cleaning dust from



boiler settings, or removing accumulations in any place hard to get at, is this suction cleaner, made of standard pipe fittings.

GAS HAS INFLUENCED LONDON FOG CONDITIONS.—Prof. V. B. Lewes, in his lecture on "The Hygienic Value of Coal Gas as an Illuminant and a Fuel," given at the recent Manchester Gas Conference, said: "The wide introduction of the gas stove in London is responsible for this. One-sixth of the chimneys, he stated, have ceased to add their quota of smoke to the atmosphere, and the registers show more hours of sunlight, while the cleansing of the fog is a still more marked result."

COAL WASTE IN CENTER-DUMP CARS.—Greater plant economy—that goal toward which every engineer is striving—was the subject discussed by Mr. F. M. Wilkes, in a paper read before the Missouri Public Utilities Association. Describing a trip through his generating station, accompanied by the president of the organization, the speaker said: "As luck would have it, just as we started to the plant two 'hoboes' whom I had employed to unload coal came into the office with a slip from the plant engineer stating that they had finished the unloading and desired their money. I paid them and we proceeded to the plant. The car which they had been unloading, supposedly empty, was standing on the side track next to the coal bin. It was a center dump car with pockets in the bottom, and the sight of these must have suggested something to my companion. He proposed that we go over and look at the car and see if it was thoroughly cleaned out. We found that the 'hoboes' had done a fairly good job of emptying the car, but each of the pockets still contained about one-quarter of a ton of coal which had not been removed because it was difficult to shovel out. This coal had probably been in the car ever since it hauled its first load and I have no doubt that our company has already paid for that same coal more than twice. And not only had we paid for the coal, but also the freight on it and the 'hoboes' to unload it. Since then I have had every lump removed from the bottom of each car, for I do not relish the idea of sending about a ton of coal back to the mines for reshipment to me and perhaps to be again returned to them, and so on—until the car and the coal got worn out and the railroad had to get a new car and new coal and start all over again."

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,109,952. Saw Guide for Gas Pipes. C. H. Armstrong, Bridgeport, Conn.

1,110,081. Retort Discharging Machine. J. J. Simmonds, Iola, Kas., assignor to The Simmonds Engineering Co., same place.

Items of Interest
FROM VARIOUS LOCALITIES.

MR. J. M. MOREHEAD, Consulting Engineer of the People's Gas Light and Coke Company of Chicago, has been elected President of the International Acetyline Association.

STOCKHOLDERS and Directors of the Rochester (N. Y.) Light, Heat and Power Company, at their annual meeting, elected the following officers for the ensuing year:

President and Treasurer—J. H. Sonntag.
Vice-President and Secretary—O. C. Decker.
Directors—J. H. Sonntag and J. G. Sonntag, Rochester; O. C. Decker, H. L. Henley and A. P. Hedges, Chicago.

THE Bath (N. Y.) Electric and Gas Company has announced a straight reduction of $5 on every range sold during the month of September to a new consumer. Their circular says:

"These ranges will be sold only to people who are not gas consumers at the present time. No ranges at reduced prices will be sold to people who are now using gas for lighting or cooking. There reductions are made as an inducement to those who are not familiar with the big advantages of gas over coal and oil. An order to set a gas meter must be given at the time the gas range is purchased.

"At the above prices the ranges are genuine bargains and our advise to you is to hustle, for they won't last long at these figures.

"This special price includes the piping connections within the house but not the service pipe from the street to the house. This is put in at our regular price of 15 cents a foot from the curb line to the cellar wall.

"Samples of these ranges are on display in our office and we ask you to call and inspect them."

A CORRESPONDENT in Fall River, Mass., writes this: "The Gas company deserves to be complimented for the fashion in which it has improved and beautified the grounds around the old holder house at the junction of Hartwell and Fifth streets. Where a year ago was an accumulation of material filling the yard about the building, there is now a considerable piece of green sward, with a border of dahlias and a set garden in the middle, while the great elm, whose presence one hardly noticed before, now stands clear and distinct, like a sentinel at the corner. The company might have been pardoned if it had continued to use the space as it had previously done, for the property is in the work-a-day section of the city and did not offer any contrast to the region around. It has chosen instead to make a garden spot of it, and the result is altogether pleasing and commendable. More such spots in the city would add greatly to its attractiveness."

THE Allentown-Bethlehem (Pa.) Gas Company has nearly completed the improvements in its Allentown plant, which will make Allentown one of the largest gas manufacturing centers for its size in the country. The improvements have been under way for the last few months and aggregate an expense of approximately $350,000. The plant is being enlarged and when completed the capacity will be exactly doubled. This means that they will be able to manufacture and send out on an average of about 900,000 cubic feet per day. High pressure mains are being laid connecting Allentown with the Bethlehems and Catasauqua. The line to Catasauqua is about completed and the South Bethlehem line, being laid via South Allentown and Salisbury township, will be ready for use in about six weeks. The enlarging of the works and these high pressure mains will, in case of emergency, permit all the gas for the Bethlehems, Catasauqua and Allentown to be manufactured in Allentown.

CHARLES HUBBARD JOHNSON, Cashier of the Boston Consolidated Gas Company, and its oldest employee, has been elected to the Board of Directors of the Company by the profit sharers, who are those employees who prove most efficient. They receive dividends each year on their salaries at the same rate paid on the company's stock. The profit sharing dividends are applied to the purchase of stock, so that employees may gain interests in the Company. Mr. Johnson has been 62 years with the Company. When he entered its employ, Samuel A. Eliot, father of President Emeritus Eliot, of Harvard, was its President, and gas sold at $3.25 a thousand feet.

IT is announced that in order to simplify accounting and eliminate unnecessary details, the business of the Rockville Gas and Electric Company, in Stafford, Conn., will hereafter be conducted under the name of the Rockville-Willimantic Lighting Co., Stafford division.

TRUSTEES of Redwood City (Cal.) have voted to grant the Pacific Gas and Electric Company permission to build a gas storage plant on the company's property at East Marshall and Washington streets.

THE installation of the new gas making machinery at the plant of the Orlando (Fla.) Water and Light Company, has been completed by the United Gas Improvement Company, the new machinery replacing that erected in 1887, which will be retained as a reserve.

MR. S. SMITH, formerly General Manager of the Concord (N. C.) Gas Company, has taken charge of the Statesville gas plant, and has moved his family to that city.

MR. GEORGE WHITING, of D. Whiting & Sons, milk contractors, has been elected a director of the Cambridge (Mass.) Gas Light Company, taking the place of Henry Endicott, who died November 8th, 1913. Mr. Whiting is a resident of Somerville and has large business interests in Cambridge.

OCTOBER 22 is the date on which the city of Waycross, Ga., will decide whether the holders of the gas franchise have complied with the conditions imposed upon them when the franchise was granted. The city gave the gas company 6 months to begin work on the plant and specified that within the following 6 months at least $20,000 must be spent on the plant. It was felt that under such conditions the company, once work was under way, would certainly complete the plant. The holders of the franchise have perfected their organization, Birmingham men being officers and directors, and have started work. The question that remains to be settled is the one regarding the expenditure of $20,000. With about a month left the company will most likely have to do some hustling, although the local representative has every assurance the franchise conditions will be lived up to without trouble.

THE 100th anniversary of the writing of the Star Spangled Banner was celebrated in New York by the orchestra composed of the workingmen in the repair shop of the Consolidated Gas Company, playing for the first time in the auditorium of the Consolidated Gas Company's buildings, Irving Place and 15th street. The concert was listened to by about 700 of the 2,100 persons employed in the building. The members of the orchestra wore their overalls and jumpers. Silk American flags were distributed with the programs and each visitor was given a photograph of the orchestra. In the audience were George B. Cortelyou, President of the Consolidated Gas Company; Lewis B. Gawtry and Robert A. Carter, Vice-Presidents; William H. Bradley, Chief Engineer; W. Greeley Hoyt, President of the Standard Gas Light Company; George W. Doane, President of the New Amsterdam Company, and several representatives of the New York Edison Company.

MANAGER S. E. DEFREESE, of the Chattanooga (Tenn.) Gas Company, has been in Chicago to confer with representatives of the Chattanooga Gas and Coal Products Company relative to concluding a contract for the purchase by the former of gas produced by the latter when its coke ovens plant is established. Preliminary details of the proposed contract were discussed a month ago in Chicago and later informally discussed by Mr. DeFreese and Lewis T. Wolle, of the Chattanooga Gas and Coal Products Company. The contract, if ratified, would probably become effective next July, for by that time the coke ovens plant must be completed, according to terms of the Chamber of Commerce's donation of the Alton Park building site.

MR. WILLIAM DAVIS, South Omaha Manager of the Omaha (Neb.) Gas Company, but a resident of Omaha, is a candidate for member of that city's Board of Education, and will no doubt be elected.

THE Twin State Gas and Electric Company, of Brattleboro, Vt., has purchased of the Henry Allen estate several acres of property on Vernon street, as a site for the gas plant which eventually must be removed from its present location on the river bank near the railroad station, on account of changes in the railroad yard. It is not expected their will be any activity in the building line in the immediate future, but the opportunity came to buy the property, which is desirable because of its location on the railroad and because it will not be necessary to lay a long line of pipes from the plant to the mains.

THE St. Paul (Minn.) Gas Light Company has protested to the Water Board against the regulation requiring the Company to pay 50 cents a foot for its pipes laid in the trench with water pipes in rock foundation. For many years the old water board permitted the gas company to lay its pipes in water trenches free of charge on the theory that in making service connections there would be less danger of rupturing the gas pipes. The new board discontinued the free trenches in stony ground.

THE City Council of Virginia, Minn., has disposed of the vexatious problem of locating the municipal gas plant, which has been a bone of contention since the city decided to build it, by deciding by a vote of 5 to 4, to locate it at the foot of Spruce street. Opponents of the plant objected to having it located in several proposed places because of the alleged odors. There is a possibility of court proceeding yet being instituted to defeat the matter.

THE Oklahoma Gas and Electric Company, at Oklahoma City, announces that it will refund deposits made by customers in "good standing" on prepay gas meters installed. The object in requesting deposits on the prepay meters was to insure the safety of the appliance.

ANOTHER extention of 30 days on the forfeiture bond of the Little Falls Darling (Minn.) Gas Company has been granted by the City Council. The company now has until Oct. 1 to start work without its failure to do so costing the company at the rate of $20 a day. The delay in getting started has been because of failure to get title to the plot on which the works will be built.

THE September meeting of the Consumers' Gas Company (Toronto) Educational Association was held the 14th inst. Mr. W. J. Fuller, Superintendent of the Lighting Division, took charge of the discussion of N. C. G. A. lesson No. 7, on Outdoor Lighting. After a 15 minute review of the historical facts relating to street lighting, Mr. Fuller took up the lesson proper, and by means of numerous lantern slides explained the systems of lighting in use. Charts were shown giving the way to figure candle power for the illumination of any kind of business. Mr. G. W. Allen, Advertising Manager, was next called upon to give a review of the work done in his department. Mr. Allen showed numerous lantern slides illustrating the many forms of advertising turned out by the company; booklets, pamphlets and folders covering many divisions of the company's work, and layouts of advertising copy were shown and explained. Mr. Harry Farr operated the lantern to good purpose.

AT the annual meeting of the American Public Utilities Co., held in Grand Rapids, Mich., officers were elected as follows: President, Joseph S. Hart; Secretary, Blaine Gavett; Assistant Secretary-Treasurer, Willis J. Ripley. Mr. Charles B. Kelsey was elected Chairman of the Board of Directors. The remainder of the Board is as follows: Messrs. John H. Blodgett, Boston; C. A. Boalt, St. Paul, Minn.; Joseph H. Brewer and Blaine Gavett, Grand Rapids; Hugh H. Harrison, Indianapolis; Joseph S. Hart, Grand Rapids; E. Clarence Miller and Henry S. Morris, Philadelphia; W. J. Maloney, Wilmington, Del.; Charles McPherson, Grand Rapids; W. B. Parsons, Winona, Minn.; George T. Whitworth and W. J. Ripley, Grand Rapids.

THE Welsbach Company has issued an announcement of great interest to consumers of mantles, that will allay the prevalent apprehension as to a possible shortage in supply. It is as follows:

"We are the only manufacturers of gas mantles in the world whose raw material supply will not be interrupted by the foreign war. Our plants are running at full capacity, and we will make prompt deliveries on all high grade Welsbach mantles at the reduced prices announced just prior to the European crisis."

PROSPECTS seem bright for a reduction in Chicopee's gas rate to 85 cents the rate charged in the other communities served by the Springfield (Mass.) Gas Light Company. The hearing which was to have been held before the State Gas and Electric Light Commissioners has been indefinitely postponed as a result of new developments which seem to make an appeal to the State authorities unnecessary.

Utilities Commission News.

LINCOLN, NEB., RATE.—Judge J. J. Sullivan, for the city, in his report to Federal Judge W. H. Munger, recommends that the court find the dollar gas ordinance valid and non-confiscatory in 1912 and in 1907. He does not hesitate to go counter to the court itself and holds that the occupation tax levied in 1906 and never collected is valid and collectible. He rejects any franchise value, reduces some of the salaries materially, criticises the generous social expenditures of the company, and permits only a small going concern item to go into the total valuation. The court, with this report before him, will make his decision. The company or the city may then take an appeal to the Supreme Court again. This is the second decision against the company in Circuit Court in the last 8 years.

Judge Sullivan follows more nearly the valuation set by the company's expert on the items of building cost and works equipment, but rejects most of the items of going concern, and in the end determines the entire plant, January 1, 1913, to be worth $676,565, or a little more than half as much as the company contended it was worth. The gross earnings were $226,297 in 1912, the operating expenses should have been $180,639, and the net earnings should have been $46-658, or 6.9 per cent. on the value of the plant. The value of the plant in 1907 was 436,565, found by subtracting what had been put into it since that date and depreciating it at the proper rate. The net earnings in that year should have been $22,349, or 5.12 per cent. on the valuation he finds proper.

Concerning the proper rate that a public service corporation ought to be permitted to earn, the court says that 8 per cent. is the last asked or demanded from private business, but points out that these businesses are subject to keen competition and hazard. The gas company is subject to nothing of the kind and the court feels that if not less than 6 per cent. were earned on the actual present value of the plant, it would not be non-compensatory.

The conclusion of Judge Sullivan reads: "My conclusion is that the ordinance reducing the price of gas from $1.20 to $1 has been, at all times, enforceable according to its terms, and that the injunction heretofore granted restraining its enforcement should be vacated and the bill dismissed."

THE UP-STATE NEW YORK PUBLIC SERVICE COMMISSION has granted permission for two extensions of its plant and the exercise of two new franchises by the Central Hudson Gas and Electric Co., one in the town of Wappingers, Dutchess county, and the other in the town of Hamptonburgh, Orange county. In the case of the extension in Dutchess county, the commission allows the new extensions only where they do not interfere with the already established business of supplying electric current to the public by the Garner Frint Works in Wappingers Falls, Hughsonville and certain other communities in the southwestern part of the town.

EMPIRE STATE ASSOCIATION ON MUNICIPAL COMPETITION.—The Empire State Gas and Electric Association, through Mr. James T. Hutchings, the President, and Mr. C. H. B. Chapin, the Secretary, has submitted to the New York Public Service Commission, Second District, a discussion of questions arising from the application of the village of Bath for a certificate of authority to construct an electrical plant. The Association quotes from decisions of leading commissions on the subject of competition against existing plants. It states that while there is practical unanimity among regulating bodies in the acceptance of the theory of regulation in place of competition, there are some differences as to the extent to which the theory may be applied. It mentions the acknowledged fact that duplication of investment is an economic waste injurious in the long run to the public which it is one of the duties of commissions to protect. It holds that a commission, as well as a company, is responsible for the adequacy of the service in any community and the reasonableness of the rates charged, and that the commission may not shirk this obligation on account of the difficulties of the situation. While steps are being taken in all parts of the country to conserve natural resources, often at great expense, it appears illogical and prejudicial to the public welfare to compel or even permit the waste of artificial resources already created. The association believes that it is the duty of the commission to utilize every means at its disposal to prevent the economic waste consequent upon duplication of investment and facilities in the public service.

Financial Notes.

OF a list of 26 public utility companies, whose earnings have been compiled for the month of July, 19 show increases in gross earnings and 7 show decreases. The largest increase was that of the Pacific Gas and Electric Company, the increase being $140,730. Net earnings of the company increased even more than did gross earnings—$212,734. The total increase of gross of all the companies reporting was $431,222, or 10 per cent.: the total increase of net was $388,039, or 18 per cent.

THE following prominent Massachusetts gas and electric light companies report for the year ending June 30, 1914:

	Gross.	Net.	Divs.	Surp.
Brockton Gas	$356,304	$103,828	$71,040	$32,788
Haverhill Gas	239,972	48,179	105,030	*56,851
Fall River Gas	532,963	123,709	86,250	37,459
Lowell Gas	691,099	164,188	120,000	44,188
Salem Gas	223,649	62,823	49,960	12,863
Cambridge Electric	480,030	200,411	103,500	96,711
Fall River Electric	417,355	166,847	88,000	78,847
Haverhill Electric	265,915	106,397	77,655	28,742
Lowell Electric	445,451	154,677	94,112	60,565
Salem Electric	267,211	94,185	70,906	23,279

*Deficit.

OF a total of 1,842 stockholders registered on the books of the Laclede Gas Light Company as of June 30, 1914, 25 were Europeans, holdings amounting to $249,000, of a total outstanding stock of $10,-700,000 common and $2,500,000 preferred. On June 30, 1913, there were 1,790 stockholders, of which 21 were Europeans, holdings totaling $230,000. Number of women stockholders June 30,1914, 777 against 695 June 30, 1913. Total number of stockholders in 1906. 552; in 1901, 269.

THE Sheboygan (Mich.) Gas Light Company has filed an amendment to its charter with the Register of Deeds, increasing its capital stock from $150,000 to $750,000. The stock will be divided, $500,000 preferred stock and $250,000 common stock.

PRESIDENT CORTELYOU, of Consolidated Gas Company, is quoted as saying: "I do not think this a time for despair, but rather for fresh efforts to push ahead into new fields, as well as for development of old ones. Least of all do I think this a time for abatement of publicity efforts: these should be redoubled now, because, if advertising increases demand and stimulates production, this is the time to advertise."

THE Western States Gas and Electric Co., a subsidiary of Standard Gas and Electric Co., has applied to the California Railroad Commission for authority to issue $1,500,000 six per cent. 3-year notes, to be secured by a trust deed on all the properties of the company. The lien of the notes issued under the trust deed will be subsequent to the liens of the trust deeds securing the bond issue of the American River Electric Co., dated July 1, 1903, and that of the Western States Gas and Electric, dated June 1, 1911. Of the new notes the company wishes to issue and sell $1,050,000 at once.

THE detailed figures of the operation of the Boston Consolidated Gas Company for the year ended June 30 have been filed with the Massachusetts gas commission, as follows:

	1914.	1913.	1912.
Gross	$4,987,500	$4,733,110	$4,339,830
Net	1,392,278	1,530,043	1,432,861
Other income	22,507	14,539	9,978
Total	1,414,785	1,544,572	1,442,839
Interest	151,727	121,290	96,202
Balance	1,263,058	1,423,282	1,346,567
Dividends	*1,209,968	1,361,214	1,361,214
Surplus	53,090	62,068	†14,667

*8 per cent. in 1914; 9 per cent. in three previous years. †Deficit.

The largest daily output of gas during the year was 22,485,000 cubic feet on Jan. 13, 1914, which compares with 21,062,000 in previous year, 19,963,000 cubic feet two years ago, and 19,409,000 cubic feet in year ended June 30, 1911. The smallest daily output was 7,839,000 cubic feet on July 4, 1913, compared with 7,675,000 cubic feet the previous year, 6,459,000 cubic feet 2 years ago, and 6,177,000 in year ended June 30, 1911. It sold 868,026,800 cubic feet of gas to other companies compared with 842,674,000 cubic feet in previous year, and 781,103,400 two years ago. Receipts from these sales were $430,-167 or $62,477 larger than in previous year. The number of services increased from 90,741 to 92,239. Plant account increased $374,882 to $26,167,855.